GAS JOURNAL

LIGHT ✂ HEAT ✂ POWER ✂ BYE-PRODUCTS

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Editorial Notes.

A Good Case.

THERE are a number of strong points to be found in the address which was delivered by Sir David Milne-Watson, D.L., LL.D., as President of the British Road Tar Association, at the second annual meeting last week; and we reproduce the address in full, in the hope that readers may find opportunity of making profitable use of these points. They themselves know, of course, the value of their own product; but the process of educating the lay mind to its advantages is a long and tedious one, and the task is still very far from accomplishment. Big efforts are constantly being made; but much good may also be done by continuous small ones. Let each reader make up his mind to neglect no opportunity of putting in a good word for "British tar on British roads." Such opportunities present themselves with unfailing regularity; for motoring, in one phase or another, is probably still the most discussed subject in the country, and motoring and the roads are one and indivisible.

The moment, too, is opportune; for the question of unemployment is greatly to the fore, and, as the President said, the extended use of road tar can contribute its quota towards the solution of this terrible problem. The gas and coking industries produce, in about equal quantities, 2 million tons of tar per annum; while only one-third of this is used for purposes of road construction and maintenance on the 180,000 miles of highways in this country. As these roads are still inadequate to meet the growing demand made upon them, there is a continually expanding outlet for road tar. It is giving satisfactory results in all parts of the country; and this will continue to be the case, so long as the quality remains good and standardized. Here, as well as in propaganda, the Association is doing invaluable work.

It will be seen from Sir David's address that the specifications for Tars Nos. 1 and 2 have now been passed officially by the British Engineering Standards Association, which involves their issue as the official British standards. There is, however, no intention whatever of resting satisfied with this achievement; the Association will continue to aim at improvement in every possible direction. In this it is felt that help will be rendered by the advent of the Chair of Highway Engineering, by which an impulse has been given to the scientific aspect of the road problem; and we are therefore pleased to note the intention of the industry, not only to support the Chair by a considerable donation, but also to establish a Research Foundation, from which it is confidently hoped valuable information will emanate. A further step which will meet with general approval is the Council's authorization of the appointment by the Association of a Research Chemist, who will work in the laboratory of one of the members on problems of more intimate concern to the industry. It seems to us that in concentrating thus upon quality the Association is doing the greatest possible amount of good, particularly when these efforts are combined with the publication of general directions and specifications for the construction and maintenance of roads with tar and recommendations for the surface tarring of roads, which will enable users to get the best out of an excellent article.

Let Theory Lead Practice.

PROF. ALFRED H. WHITE stated in a paper before the American Gas Association that research is the best investment which the gas industry can make. Our industry, he suggests, has grown through the slow and expensive processes of trial and error, and it is time that more attention was paid generally to the development and applications of theory. As many of our readers are aware, Prof. White, who has done a great deal to improve the efficiency of gas-works processes, occupies the Chair of Chemical Engineering at the University of Michigan; and he instances a few of the contributions of chemical engineering to the gas industry—heat transfer, condensation, and scrubbing, and so on—and shows how the development of our knowledge of mathematics, physics, and chemistry has changed the outlook of the modern gas-maker. A combination of these three sciences should constitute the mental equipment of those responsible for the manufacture and the distribution of gas; in other words, the gas-maker should be a chemical engineer, as distinct from what is commonly regarded as a "civil" or a "mechanical engineer."

It is, of course, all a matter of mental attitude. The attitude of the chemical engineer is to resolve an operation into its constituent units and to separate each unit into its parts; and it is surprising how few unit operations there are in the whole range of gas-making. We have mentioned heat transfer—seemingly a simple problem, but which actually can be resolved into a number of steps. The correct evaluation of the importance of these different steps has unquestionably led to the reduction of "fuel per ton of coal treated" in all types of carbonizing plant, and it has eliminated much laborious and unnecessary work on "trial by error" lines, a method which at a certain period slowed-down the progress of the industry. Our present policy should be to allow theory to lead practice—to have as far as possible full data at disposal when changes in market values of gas-works products, or other modifications of current conditions, render a different mode of gas manufacture or distribution desir-

able. All manner of chemical-engineering problems will have to be studied in advance. One task is the manufacture of coal gas and water gas of substantially the same properties, so that they may be mixed in varying proportions in the event of interlocking distribution systems; the possibilities of high-pressure purification might well be investigated; many processes to-day, such as the synthesis of methanol and liquid fuels, might, as the result of further experiment, come into the realm of economic politics. We could enumerate freely other possible lines of development, but sufficient has been said to justify our agreement with Prof. White's assertion that research is an excellent investment. It is not that we belittle experience, for this is rightly held a valuable asset, and the results of experience are not to be lightly set aside by any theorist. Our point is that theory ought never to be set aside by the "practical" man. There is a happy medium between the saying attributed to Henry Ford, that "if it has always been done that way, then it must be wrong," and the all too prevalent idea that, if it has always been done that way, it must be right.

Thermal Value of the Electrical Unit.

In the Correspondence page of the "Journal" a fortnight ago, Mr. Charles F. Botley (Engineer and General Manager of the Hastings and St. Leonards Gas Company) drew attention to the fact that there is still a good deal of divergence in the figure used as the heat equivalent of the Board of Trade unit of electricity; and he pleaded once again for uniformity of practice. When President of the Institution of Gas Engineers in 1926, Mr. Botley pointed to the need for a uniform figure; and we agree with him. Examples culled from various sources and quoted in an article which appeared in the "Journal" on July 1, 1925, showed figures varying between 3410 and 3440; and though these differences may not seem large, they certainly tend to confuse comparisons.

The figure used by the Institution of Electrical Engineers is 3412, and Mr. Botley asks whether we cannot all use this. Let us try. To this end, 3412 shall be the figure quoted in the forthcoming edition of the "Gas Journal Calendar and Directory." Unfortunately, it is now too late to revise all the calculations (at present based upon 3415) in the "Gas Salesman's Diary" for the 1930 edition; but the alteration will be made before the following edition goes to press. We are indebted to Mr. Botley for his interest in this matter.

All-Round Activity.

The first thought that passes through one's mind on glancing over the report of the Gas Companies' Protection Association—an extended account of the proceedings of the thirty-second annual general meeting of which will be found in this issue of the "Journal"—is of the evidence which it affords of intense activity. Whatever may be the case with other of the country's leading industries, that of gas supply is clearly in "full cry." But with an industry that is not standing still, there are ever-changing conditions to be met; and the Association, under the Presidency of Dr. Charles Carpenter, C.B.E., makes it its business to meet them from the particular angle of the gas company. This is emphasized by the statement in the report that Mr. H. E. Bloor, of the York Gas Company, has given evidence before the Area Gas Supply Committee on behalf of the Association, and that a point which he will stress before the Committee is the position of gas undertakings owned by companies, as compared with those in the hands of municipal authorities.

The report was presented to the meeting by the Chairman of the Association (Mr. R. W. Edwards, who is Chairman and Managing-Director of the Aldershot Gas, Water, and District Lighting Company); and he outlined the features of the work which has been accomplished during the relative financial period. In particular he dealt with the various problems arising from modern practice in highway construction—a subject to which, as readers of the "Journal" are well aware, Mr. Edwards has devoted a great amount of attention.

Coke Surface and Producer Gas Making.

In later columns to-day, under the somewhat academic title, "The Equilibrium $CO_2 + C \rightleftharpoons 2CO$," we publish a paper by Prof. J. W. Cobb and Mr. F. J. Dent which has a very practical bearing on the working of producer gas plants, and is an important confirmation of the interesting views put forward in the Gas Fellowship Report for 1929—see "Journal" for June 12—regarding the factors which influence the reactivity of coke. The Fellowship Report was concerned largely with the nature of the coke surface as distinct from the amount of actual surface exposed to the producer gas action, and the opinion was then expressed that some of the carbon atoms on the surface (the boundary between the gaseous and solid phases) are less securely bound to the main body of the coke than others. These unstable atoms are gasified most rapidly, and consequently the proportion of them in the surface is continually being reduced. This causes, in general, the reactivity of the coke to decrease as gasification proceeds.

The contribution published in this issue of the "Journal" shows how research on one phase of a subject can throw light on a hitherto uncomprehended factor which may be regarded as another phase. In the investigations on the reactivity of coke with and without the addition of inorganic constituents, undertaken at the University of Leeds in collaboration with the Institution of Gas Engineers—the results of which have been published during the last few years mainly in the reports from the Gas Research Fellowship—the desirability, and in some instances the absolute necessity, arose of making some determination which would give a measure of the reactivity which depended not upon the amount of surface exposed, but entirely upon the nature of the surface. The measurement of the equilibrium composition attained when the carbon was acted upon by carbon dioxide gave that information to those prosecuting the research; and the recent work on the effects of sodium carbonate proved of the greatest assistance. Prof. Cobb and his collaborators have been able to show clearly that the equilibrium is not the same for different forms of carbon, and that the possible alteration of the carbon during the heating process has always to be taken into account. The paper we publish to-day should be read in connection with the 1929 Report of the Gas Research Fellowship.

The equilibrium studied in the contribution is one of primary importance for gas producer and analogous practice, since it limits the extent to which the carbon-dioxide content of producer gas can be brought down at any particular temperature. It is shown, for example, that at 800° C., with a non-graphitic carbon, the carbon dioxide can be reduced much lower than the 13·5 p.ct. which has in recent years been assumed to be the limit on the basis of the experiments of Rhead and Wheeler. The value of 13·5 is that for graphite or a graphitized surface.

Distinctive Share Numbers.

We confess our inability to share in the sense of keen disappointment which is said to be felt in some parts of the City over the decision of the Government not to introduce a Bill to amend the Companies Act as regards the distinctive numbering of shares. It may be that distinctive numbering involves clerical labour and expense; but the saving of work (which presumably is paid for) is not of itself sufficient justification for doing away with a method which must prove valuable when cases of doubt as to validity arise. That this is a "get-rich-quick" age no one will feel inclined to deny; but laborious work still finds a place in the scheme of things. It is regarded as quite possible that events which have come to light in connection with the Hatry case may have influenced the Board of Trade in their decision not to proceed with the Bill.

Pylonic Conspirators.

Electricity has received an incalculable amount of boosting of recent times. So much, indeed, that actual achievements seem to be but small results of the output of such stupendous energy. "Indiscretions" have at times been perpetrated by the friends of this young industry; but mostly these

have consisted merely of dipping the paint brush too deeply into the pot and applying the colour on too generous a scale. Until a fortnight ago we do not remember to have come across anything likely to arouse "class feeling" on a subject calling for nothing of the kind; but Mr. Frank Hodges has adopted a line of his own in this respect which we trust will not be looked upon as meriting the "sincerest form of flattery." He was referring, at the annual dinner of the Southern Section of the Electrical Power Engineers' Association, to the agitation against the erection of the Central Board's overhead lines on the Sussex Downs and elsewhere; and he said that "while there were undoubtedly a number of people and organizations who were deeply concerned to protect as far as possible in our industrial island the beauties and amenities of our countryside, there were others who were making a brazen effort to preserve their own selfish interests at the expense of the improvement in the standard of life of the industrial and rural population. Not only were such people selfish to a degree, but they endeavoured to set up a code of conduct for themselves which they would publicly declare as reprehensible in the working classes, if the latter adopted it." It would be a pity indeed if such a domestic question as the supply of electricity over the country could not be discussed without this sort of argument.

Industrial Workers and their Electricity.

But Mr. Hodges did not stop there. He proceeded to declare that "the industrial community would certainly resist the efforts of the rich, who had made their money out of the industrial community, and who had the good fortune to live somewhere in our beautiful and sequestered countryside, to prevent the rural population surrounding them from having the full advantages of modern electrical development. The working classes would never agree to the additional, almost fabulous, cost that the Electricity Board would be put to if the schemes of these protesters were adopted in the countryside; for every pound needlessly expended in putting cable underground to preserve rural amenities meant that the industrial worker, who rarely had the opportunity of visiting these beauties, had to pay dearer for his electricity, and was deprived of the opportunity of having even those smaller amenities in his industrial life which were absolutely essential to his physical existence." We had not known that either the Lake District or the Sussex Downs was so inaccessible as to be but rarely visited by the working classes. Had he taken a longer view, Mr. Hodges might have felt more favourably disposed towards preservation for the industrial worker of rural amenities. The rich are freer to choose their place of residence. And are pylons and cheaper electricity one and the same thing?

What about the Landowner?

Perhaps Mr. Hodges is not concerned with the landowner; but many of them are not rich, and it is the serving of them with current that is made largely the excuse for the establishment of the electrical grid. Switzerland is often enough quoted by supporters of the pylon-and-wire system; and so there can be no harm in quoting a statement which a resident there some time ago forwarded to "The Times." Here is what he said: "The regulations in the Canton of Vaud, which are obviously necessary in the interests of human safety, and are presumably much the same as those in force elsewhere in the world, preclude building within a distance of 5 metres on either side of the wires, making an unusable band of 10 metres in all. Naturally the wire-line proceeds by the most direct route. It cannot go round a property, but strikes across it. I have recently inspected the scattered estate of a friend in this district, which is about 1000 ft. above Lake Geneva and 2000 ft. above the sea, a level which when the wires were placed probably only suggested low agricultural or forest values, but which is now being recognized as one of the very best for residence. In a large number of cases magnificent sites on this estate are unavailable for building, because the wires cut across them, dividing a field, possibly diagonally, and creating insurmountable awkwardnesses in lay-out. If the system be adopted in Britain, the same loss of values will in a few years result (and they are rateable and taxable values, by the way, and so have their local and national importance). Land which is at present agricultural will be required for building, and much of it will be found to be impossible of use."

Government and a Large Gas Scheme.

During his statement on unemployment, in the House of Commons on Monday, Mr. J. H. Thomas, Lord Privy Seal, mentioned that the Government Grants Committee had approved of an application by the Gas Light and Coke Company in respect of a scheme of expenditure amounting to £430,000, spread over many districts.

The "Gas Salesman" Supplement.

In addition to the extraordinary interest attaching to the "Gas Salesman" Supplement which appears with this issue, it may be mentioned that in the matter of size it constitutes a record. Mr. H. Ernest Hunt continues his series of addresses; and there are the papers submitted by Messrs. P. G. G. Moon and C. M. Croft at the recent "B.C.G.A." Conference, together with a report of the joint discussion. The lecture delivered on the same occasion by Mr. A. W. Smith is also reproduced. The Salesmen's Circles are proceeding with their new session with unabated enthusiasm, and useful papers and discussions are reported. The Newcastle and Gateshead Gas Company have now adopted the Travelling Gas Showroom.

Telephone Manners.

At Eastbourne, a lot of attention was devoted to telephone manners, which seems an extraordinary indictment of present-day conditions. With educational facilities that are continually improving, and which have already attained excellence, it would be difficult, were one not painfully aware of the need, to understand the bringing forward of such a point. It seems almost that one is tackling things at the wrong end, by suggesting the teaching of foreign languages to children, while so many of them have never learned to make proper use of their own. Do the kind of people with whom we all, alas! come in telephonic contact at more or less frequent intervals, really believe that the world will be a happier place, if all the people endeavour to transact their business by the emission of a series of grunts? Courtesy in all circumstances should be a minimum, and not a maximum, requirement; but there is less justification than ever for rudeness when the victim is at the other end of a long wire! Referring again to telephones, we like Mr. Shapley's suggestion that those answering calls should begin by saying: "Gas Department."

FORTHCOMING ENGAGEMENTS.

[*Secretaries of Gas and Kindred Organizations are asked to assist in making this diary of events as complete and useful as possible by sending the earliest intimation of all meetings.*]

Nov. 14.—MIDLAND JUNIOR GAS ASSOCIATION.—Meeting in Birmingham. Discussion on the "Relative Advantages of Iron and Lead for Internal Carcassing."

Nov. 16.—WALES AND MONMOUTHSHIRE JUNIOR GAS ASSOCIATION.—Meeting in Cardiff. Paper by Mr. A. J. Cruise on "The Gas-Works Power Plant Problem."

Nov. 16.—SCOTTISH JUNIOR GAS ASSOCIATION (EASTERN DISTRICT).—Joint visit with Western District to Granton Works.

Nov. 16.—YORKSHIRE JUNIOR GAS ASSOCIATION.—Meeting at Leeds.

Nov. 18-23.—PUBLIC WORKS, ROADS, AND TRANSPORT CONGRESS AND EXHIBITION.—Royal Agricultural Hall, Islington.

Nov. 20.—SOCIETY OF BRITISH GAS INDUSTRIES.—Meeting of Council in the morning.

Nov. 20.—SOCIETY OF BRITISH GAS INDUSTRIES.—Autumn General Meeting, Hotel Metropole.

Nov. 22.—LONDON AND SOUTHERN DISTRICT JUNIOR GAS ASSOCIATION.—Meeting at the Westminster Technical Institute at 7.30 p.m. Paper by Mr. A. G. Grant, M.Sc., on "Some Aspects of the Carburetting Process in Water Gas Practice."

Nov. 22.—SOUTHERN ASSOCIATION OF GAS ENGINEERS AND MANAGERS.—General meeting at the Hotel Cecil, Strand, W.C., 2.15 p.m.

Nov. 28.—MIDLAND JUNIOR GAS ASSOCIATION.—Visit to Biscuit Factory of Messrs. Alfred Hughes & Sons, Ltd., Birmingham.

Nov. 30.—LONDON AND SOUTHERN DISTRICT JUNIOR GAS ASSOCIATION.—Visit to the Greenwich Tar Works of the South Metropolitan Gas Company.

PERSONAL.

Consequent on the appointment of Mr. T. ROYDEN, Uddingston, as General Manager of the Middle Ward of Lanark Gas Undertakings, Mr. D. D. MELVIN and Mr. A. SIMMONS have been appointed Works Managers at Uddingston and Cambuslang Works respectively.

Mr. J. R. GARSIDE and Mr. A. BATCHELOR, Gas Inspectors to the Leeds Corporation Gas Department, have retired after 40 and 45 years' service respectively. They were recipients of presentations at a supper at the Guildford Hotel, Leeds, on the evening of Nov. 8. Mr. E. Helliwell, Superintendent of Inspectors, made the presentations. Music was provided by a special orchestra comprised of friends of Mr. Garside, who was bandmaster of the Leeds "Pals" Battalion during the war, and by vocalists.

Alderman ERNEST HAMER, J.P., Chairman of the Blackburn Corporation Gas Committee for many years, and Chairman of the local Liberal Party, was deposed of his aldermanship, on Nov. 9, when Labour assumed control for the first time in the history of the Town Council. He took the matter in good part, wished the Socialists well in their newly found power, and having thanked all and sundry for their co-operation and assistance, retired from the Chamber. It was a moving scene in the deliberations of the Council. Among those who attended the proceedings was Mr. G. P. Mitchell, the Gas Engineer, and his Commercial Assistant, Mr. Richmond, to both of whom the retirement of Mr. Hamer from the Council must be a calamity of the first water. Ex-Alderman Hamer is known and respected in gas circles throughout the country.

OBITUARY.

The death took place on Nov. 1, of Alderman WILLIAM HART, J.P., who for forty years was a member of the Derby Town Council, and for twenty-three a Director of the Derby Gas Light and Coke Company. A month ago he was the recipient of the Freedom of the Borough of Derby.

TRANSPORT BY RAILWAY AND CANAL.

Extract from the Presidential Address of William Wylie Crierson, C.B.E., before the Institution of Civil Engineers, Nov. 5.

In the middle of the eighteenth century, roads were miry lanes, fords were common, and the conditions were such that transport of goods was largely done by pack-horse. It was not until the early years of the nineteenth century that improvements in roads led to their general use for the conveyance of freight. Well before that time, however, natural waterways, and later canals, were the principal means of transporting bulky and heavy goods. The rapid development of canals was largely a result of the success of the Bridgewater canal, sanctioned in 1762. It was probable that the prosperity of the canals, some of which at one time yielded dividends of 100 p.ct. per annum, was instrumental in hastening the advent of railways; for the proprietors, being subject to no control in respect of tolls, and believing that they held a monopoly, were unwilling to reduce their charges. The first effect of the railways, which, unlike the canals, were not affected by shortage of water or frost, was a great reduction in the charges for canal transport, rather than in the volume of water-borne traffic.

It was difficult for a railway engineer whose duties included the supervision of canals to see any hope that canal transport, in general, would prove economical to-day in England. A substantial number of the original canals were derelict, and the remainder were not prosperous. It was questionable whether useful comparison could be made with canals on the Continent, where geographical, physical, and political conditions were so different. Another factor, which did not obtain on the Continent, was that traders in England required speedy delivery of small consignments. Further, in Belgium and Germany both canals and railways were state-owned, and the policy had been to foster water-borne traffic. It seemed that any state-aided scheme for the improvement of transportation in Great Britain would be more likely to succeed if it assisted the railways rather than a system that was nearly obsolete in this country.

GAS STOCK AND SHARE MARKET.

[For Stock and Share List, see later page.]

THE Government's new loan plans accentuated the depression on the Stock Exchange last week, and caused a sharp relapse in the quotations of British Funds. There has been a good deal of criticism of the terms of the issue, but there is little doubt that the certainty of a 5 p.ct. investment for 14 years, with the possibility of extension to 34 years, makes the loan attractive, and there was widespread selling of existing stocks in order to participate therein. The 5 p.ct. War Loan was most affected by the competition, and the price fell at one time to 99⅜.

The Industrial Market was somewhat firmer towards the close of the week, but most of the British shares closed with a moderate recovery. American shares, however, were not supported, and a slight improvement was not maintained.

In the Gas Market the only bright spot was the anticipated improvement in the Uxbridge, Maidenhead, and Wycombe Company's 5 p.ct. ordinary, which on Wednesday was marked up 4 points to 97-102. The increase is obviously brought about by the terms of the stock issue of that Company to which reference was made last week. At the higher price the yield on the last dividend is just over 7 p.ct., so that the stock is still good value and worthy of attention. Further falls were registered in Imperial Continental capital, 5 points to 335-355; Primitiva ordinary 1s. to 29s.-32s.; and Gas Light and Coke 4 p.ct. ordinary, which dropped 4½d. to 18s. 4½d.-18s. 10½d. It will be seen from the Table that there were slight falls in several other capital stocks.

The following transactions were recorded during the week:

MONDAY.—Bournemouth "B" 12½, British 115¼, 116, European 12, Gas Light and Coke 18s. 9d., 18s. 9⅜d., 18s. 10½d., 19s., 19s. 1⅛d., 3½ p.ct. 61⅜, 4 p.ct. pref. 71½, 3 p.ct. deb. 58, 5 p.ct. deb. 100, Imperial Continental 347½, 355, 359¾, 360, 362, 364, 365, 366, 367, 368, 369, 370, 371, 372, Maidstone 5 p.ct. 124½, Primitiva 32s. 3d., 32s. 4½d., 32s. 6d., South Metropolitan 99⅛, 99⅜, 99¾, 100½, 6 p.ct. pref. 107½, 6½ p.ct. deb. 98½, Tottenham 3½ p.ct. 104. Supplementary prices, Barnet 5 p.ct. deb. 96, Croydon 7½ p.ct. pref. 102.

TUESDAY.—British 115¼, Gas Light and Coke 18s. 7½d., 18s. 9d., 19s., 3½ p.ct. max. 61½, 62, 4 p.ct. pref. 71½, 71¾, 72, 5 p.ct. deb. 99, Imperial Continental 357, 360, 367½, Liverpool 7 p.ct. pref. 100¾, South Metropolitan 99¾, 6½ p.ct. deb. 99, Tottenham 3½ p.ct. 104, 105. Supplementary prices, Croydon 7½ p.ct. pref. 103½, Uxbridge 5 p.ct. deb. 89.

WEDNESDAY.—Bombay 16s., 16s. 6d., British 4 p.ct. deb. 71, European 11, 11⅛, Gas Light and Coke 18s. 7½d., 18s. 9d., 18s. 10½d., 19s., 4 p.ct. pref. 73, 74, 3 p.ct. deb. 58, Imperial Continental 347, 348, 350, 351, 352½, 354, 356, Metropolitan (of Melbourne) 5½ p.ct. deb. 92½, Newcastle 3½ p.ct. 17s., Primitiva 30s. 6d., 4 p.ct. deb. (1911) 81, South Metropolitan 99¾, 100¼. Supplementary prices, Ascot District 10 p.ct. max. 11½, 11⅝, Hartlepool consolidated 5 p.ct. max. 81½, 82¼, North Middlesex new 6 p.ct. pref. 114, Sunderland 96¾.

THURSDAY.—Alliance and Dublin 98, Bournemouth 4 p.ct. deb. 72, Bristol 5 p.ct. 87½, Commercial 93¼, 93½, Croydon sliding-scale 105½, European 11½, Gas Light and Coke 18s. 6d., 18s. 9d., 18s. 10½d., 4 p.ct. pref. 74, Imperial Continental 340, 344, 347, 350, Montevideo 107, North Middlesex 6 p.ct. 114, South Metropolitan 99¾, 100¾, Tottenham 3½ p.ct. 104½. Supplementary prices, Bournemouth 7 p.ct. deb. 100, North Middlesex new 6 p.ct. 114.

FRIDAY.—Alliance and Dublin 98½, European 10¾, Gas Light and Coke 18s. 6d., 18s. 7½d., 18s. 10½d., 5 p.ct. deb. 99, Imperial Continental 320, 330, 335, 340, 343, 345, 349, 350, 352, 3½ p.ct. deb. 72, Primitiva 30s. 3d., South Metropolitan 100¼, 3 p.ct. deb. 55, South Suburban 5 p.ct. 100½, 101, 101½, 102, Tuscan 40s., Wandsworth, Wimbledon 5 p.ct. 106. Supplementary prices, Dover 123, Southend-on-Sea 91½, 91¾, new 91½, 91¾, new "B" 88½, 88¾, 5 p.ct. deb. 91, 91½.

In Lombard Street money was more plentiful than usual at the week-end. The rate for fresh advances declined from 4¾ p.ct. to 4¼ p.ct., and finally balances were offered at 4 p.ct. and under, old loans being renewed at about 4½ p.ct. Treasury Bills were allotted at £5 13s. 9·82d. p.ct., or 1s. 10½d. p.ct. below the previous week's average rate, and Discounts were easier in consequence.

Business in the Foreign Exchange Market was on a small scale. The dollar-sterling rate moved within narrow limits, and closed at 4.87⅞. French francs were slightly higher at 123.87; Belgas were dearer at 34.86⅞; Pesetas were offered freely at 34.57½; Italian lire closed at 93.13½; and Dutch florins at 12.08½.

Silver was a weak market, the quotation declining at 22⅝d. per oz., and Gold remained unchanged at 84s. 11½d. per oz.

The Bank Rate is 6 p.ct., to which it was reduced from 6½ p.ct. on Oct. 31. The Banks' deposit rate is 4 p.ct., and the deposit rates of the Discount Houses are 4 p.ct. at call and 4¼ p.ct. at notice.

DIRECTIONAL GAS STREET LIGHTING.

By R. WATSON, Engineer and Manager to the Doncaster Corporation Gas Department.

In the issue of the "JOURNAL" for Feb. 20 last, some particulars were given of the use of "Holophane" two-way directional refracting glass plates in gas lamps, for the purpose of increasing the distribution of illumination along street surfaces, and thereby its effectiveness from the point of view of visibility.

The work was principally confined to streets and roads in Doncaster where the normal lighting was of the modest character usually found in thousands of similar secondary thoroughfares in the country, and where size of lighting unit, height of luminous source, and spacing of columns together make difficult the inclusion of the resultant illumination in even the lowest class (H) of the British Standard Specification for Street Lighting.

The main objects of the Specification were to bring about a general improvement in street lighting by the adoption of higher standards of illumination, and at the same time to ensure better distribution of the light available.

It was obvious that the expense of new equipment and any increased annual charges militate against an immediate and drastic change of illumination standards by many lighting authorities, and in such cases those responsible for the actual lighting can only endeavour with existing plant to achieve some approximation to the objects in view, and hope for the future.

The Doncaster tests were made in a side street where relative absence of traffic afforded time for illumination tests. The lamps were staggered and 155 ft. apart, as originally installed. The lanterns were raised so that the triple No. 2 burner sets employed were 12 ft. above ground-level.

The horizontal illumination tests were made under exactly the same conditions as to burners, pressure, and gas usage, and the data were distinctly satisfactory in proving the advantages to be derived from the use of directional prismatic glassware.

The horizontal foot-candle values at a point (77½ ft. from the columns) midway between the lamps were as follows:

Lamps with refractors (two tests) . . .	0·022 and 0·021
,, without ,, ,, ,, . . .	0·0068 ,, 0·009

The Specification test-point values were respectively 0·0125 and 0·0025 with and without refractors.

There was also a generally increased illumination along the street surface from lamp to lamp.

Photographs with the same time exposure have recently been taken of the illumination obtained from these lamps, and, though photographs may not always be regarded as evidence, they are now published as some confirmation of the data already given. The photographs are interesting since they show the gain in both illumination and visibility along the street surface, and also a marked diminution of the dark area usually found between lamp columns. The use made of the upper hemispherical light flux is indicated by the contrast, allowing for specular reflection of the illumination, on the house walls above lantern level.

The original trial of gas lamps with "Holophane" two-way directional refractors proved sufficiently satisfactory to warrant a more general adoption of the system, and some 5 miles of streets and thoroughfares in Doncaster are now lighted by gas lamps so equipped.

Experience of nearly twelve months has not lessened belief in the possibility and value of directional gas lighting. Maintenance difficulties have not occurred. With some 150 lamps of this type in use one breakage only of a plate has occurred—and that due to handling. The glass plates have proved their heat-resisting qualities, and they have been found actually to protect the lantern panes from the fractures which previously resulted from the lateral distribution of the heat of superheater burners.

The prismatic glassware kept remarkably free from dust and involved no special trouble in cleaning.

It may be remarked in connection with the use of two-way directional refracting plates that accurate setting is essential (but not difficult to achieve). Trials in some towns have been made, and the system has been condemned in consequence of imperfect adjustment of the plates, by fractions of an inch, to the burner mantles.

During the course of testing, data were also obtained of the distributed illumination resulting from the use of No. 2 burners in cluster and line formation respectively, and these have led to the adoption of the latter. The foot-candle values obtained from direct rays were as under, and these indicate the occlusion

THREE-LIGHT No. 2 BURNERS, 12 FT. HIGH.

Left—Without Refractors. Right—With Refractors.

of light which in the case of cluster burners occurs at the important angles affecting the mid-way point illumination:

Distance from Column.	Line Set A.		Cluster Set B.	
	With Refractors.	Without Refractors.	With Refractors.	Without Refractors.
Ft.				
10	0·47	0·43	0·45	0·43
20	0·24	0·19	0·24	0·21
30	0·14	0·09	0·15	0·12
40	0·11	0·048	0·14	0·07
50	0·12	0·036	0·13	0·039
60	0·15	0·029	0·085	0·025
70	0·09	0·024	0·060	0·019

The rises in illumination at the 50 and 60 ft. distances in the case of A were due to the fact that the maximum rays were in these directions, and point to the gain to be derived from increased mounting height.

Expense precludes the replacement of existent by longer lamp columns, but until such is possible the use of a 3-in. by 2-in. reducing socket on the column neck, the required length of 2-in. pipe, and a final collar for taking a lengthened frog, may serve the purpose.

The effect of a greater height for light sources, as required by the British Standard Street Lighting Specification, can, of course, be calculated from the usual formula $\frac{I}{h^2}\cos^3\phi$ for horizontal plane illumination, where I = candle-power, and h = height of light source.

In view of the fact that too many gas lamps in the country are on the low side, it may not perhaps be inopportune to give one example of the gain which will result from the adoption of the Specification mounting heights. Two light sources, each emitting (say) 180 C.P. in the direction required and at a height of 11 ft. will yield at a midway point of 70 ft. a horizontal plane illumination of 0·011 foot-candle. If the mounting height be 13 ft.—the lowest stated in the Specification—the value will rise to approximately 0·013 foot-candle. The angle of distribution in the first case is 81·1° from the vertical, and in the second 79·5°, and as the candle-power rays available from inverted burners at the latter angle are higher in value, some further gain on the 0·013 foot-candle is obtained.

A study of the polar diagram of street lighting burner sets is well worth while, and it is satisfactory to find that some manufacturers are now publishing in their catalogues the required data of flux distribution and efficiency based on gas usage.

The question of street lighting in these days of fast moving traffic is necessarily of increasing importance, and is certainly attracting considerable attention. Since gas has for the purpose definite advantages in cost, brightness—to which the attribute of cheerfulness may be added—fog penetration, and absence of objectionable glare, there is every reason for attempts to improve, where needed, existent street gas lighting installations; and until it is possible to adopt the British Standard Specification *in toto*, some approximation to its recommendations should be sought.

BRITISH ROAD TAR ASSOCIATION.

Address by the President—Sir David Milne-Watson, D.L., LL.D.—at the Second Annual Meeting.

As an Association of producers and distillers of tar, we are engaged in an industry which is second to none in importance in the road world.

To-day, roadmaking is an integral part of our national existence, because it affects every industry, every trade, and every business, and the British public is entitled to demand a good road as its birthright. Roads have become something more than a means of travel; they have become the arteries of industry; and in towns and villages social life is more or less dependent upon them. Everyone has an interest in roads—they are the property of the people, and there is nothing private or exclusive about them.

Since we met last year, we have seen a Labour Government come into office. During the General Election at the end of May, the question of roads figured prominently in the programme of the three political parties, and on the opening of Parliament the Lord Privy Seal, in his speech dealing with unemployment, said his task was to find schemes that would not only give work to the unemployed, but also stimulate trade at home and abroad, and add, in the end, to the economic equipment of the Country.

The greatest problem of to-day is, I suppose, the question of unemployment; it is a problem which every person desires to see solved, and it is the avowed object of those in power to see how work can be provided.

If one reason more than another can be given for the fact that upwards of a million of our countrymen are unemployed—a great many of whom have been unemployed for as long as three or four years and even more—it is no doubt on account of the depressed condition of the basic industries of the Country.

A Solution to Unemployment.

Road tar, being an important bye-product of the gas and coking industries, is intimately connected with the coal, iron, and steel industries, and we believe that the extended use of road tar can contribute its quota towards the solution of the unemployment problem. The gas and coking industries produce, in about equal quantities, 2 million tons of tar per annum, of a value approximating £4,000,000. Only one-third of that total production is used for purposes of road construction and maintenance on the 180,000 miles of highways in this Country. Despite the enormous expenditure (now amounting to sixty million pounds) annually incurred, the roads of the country are still inadequate to meet the growing demands made upon them, and there is, therefore, a continually expanding outlet for road tar.

A certain prominent motor journal, in commenting on my address to you last year, said: "To us, it always seems pathetic to listen to an Englishman engaged in a British industry pleading for fair play in his Country's trade interests, and for the utilization of a home product in preference to imported materials. It appears to make little or no impression upon the spending authorities."

Laid by Unskilled Labour.

We have a good case when we plead for British tar, because not only is it a British product which is economical in use and capable of giving entirely satisfactory results, but it possesses this further advantage—it can be laid by unskilled labour under skilled supervision. Our material is giving satisfactory results in all parts of the Country, and surely the day cannot be far distant when those in control—politically, financially, and professionally—will recognize the benefit to the economic life of the country to be derived from a much wider use of British tar.

The work which we are doing through our Association is, in my opinion, of the greatest importance. Those who purchase road materials require them to be not only of good quality, but to be standardized.

Since I last addressed you, our specifications for tars Nos. 1 and 2—which even at that time had received the approval of the Ministry of Transport—have now been passed officially by the British Engineering Standards Association, and they will be immediately, if they have not already been, issued as the official British Standards. We have, therefore, secured acceptance—after what may have seemed to us extended delay—of the standards which we have set ourselves, and to which, in fact, nearly all of us have been working in anticipation. Our next task, and that an early one, will be to endeavour to improve upon them.

As to the quality of our product, I am glad to be able to report that its merits are being recognized by that most important person—the user. Road tar was the first material of its kind in the field, and now perhaps in the cycle of events, it is being realized that it is just as capable of doing all that is required of it as are many other materials which have been put forward in an endeavour to supplant it. To cite but one instance, the County Surveyor of Western Perthshire has recently made an official statement of construction, cost, and result of tests on nine experimental lengths laid 14 years ago on the Great North Road, near Dunblane. Of the nine different processes used, the best results were obtained from the sections on which British road tar was used. The actual section giving the most satisfactory result was—"A tarred material surface sealed with distilled tar," and this portion also proved to be the most economical. The cost of construction and maintenance for this section during the 14 years was under 4s. for each super yard, as compared with over 12s. in a section where a foreign bitumen was used. [See "JOURNAL" for Oct. 16, p. 189.]

The Scientific Aspect.

As an Association, however, we are fully conscious of the necessity to continue in every possible way to improve the quality of our product. With the advent of the Chair of Highway Engineering, an impulse has been given to the scientific aspect of the road problem. The results arising from the establishment of the Chair will probably be far reaching, and will have an influential bearing on the future of highway engineering. It is our intention as an industry not only to support the Chair by a considerable donation, but also to found, under the ægis of the Professor, a Research Foundation from which we hope there will emanate information of value not only to ourselves as producers and distillers of tar, but also to our customers—the highway engineers and surveyors. We

feel that, in addition to the work which will be undertaken under Prof. Clements, we should also engage upon research in connection with problems of more intimate concern to ourselves, and with this end in view the Council have already authorized the appointment by the Association of a Research Chemist, who will work in the laboratory of one of our members. Our object in undertaking this research is to supplement the efforts which are being made by us individually to improve our product, and we hope the results will be of value to the whole industry.

It may perhaps be within the scope of this address to suggest what is required of a modern road. The motorist, I think, desires a non-skid, resilient, and dustless surface; the horse driver something with a certain grittiness on the surface; the ratepayer something substantial but at the same time economical and durable; and the surveyor a combination of all the foregoing. Road tar can, we are confident, provide the binding material to meet all these demands, and we are now engaged, as an Association, upon the production of "General Directions and Specifications for the Construction and Maintenance of Roads with Tar," which we believe will be of real value in securing an extended use of our product.

We have, during the past year, made a definite attempt to eliminate the complaint of the bleeding of tar roads, and to this end we have prepared recommendations for the surface tarring of roads which, we feel sure, if they are adhered to, will have the desired effect. We have forwarded these recommendations officially to the Ministry of Transport, and we are informed by the Chief Technical Officer of the Ministry that he has not only forwarded them to the British Engineering Standards Association, but that he is also placing them before his Divisional Road Engineers.

Effect on Fish Life.

With regard to the toxic effect of tar on fish life, this question continues to receive our careful attention. We do not admit that the prejudice which exists is well founded, nor do we feel that the question of the roads crossing or running immediately adjacent to fishing streams (about 5 p.ct.) should prejudice the use of tar on the remaining 95 p.ct. of the roads.

While we are doing all we can to improve our product in quality and to demonstrate its capacity, we are faced in our business with the keenest competition from imported materials. The propaganda work of the Association has been continuously carried on throughout the year, and we believe with no small measure of success. Many favourable notices have appeared in the Technical Press, and in the Lay Press there have been signs of some recognition of the fact that there is produced in this Country, by industries which are vital to the economic life of the Country, a product which is capable, in combination with British aggregate, of making roads which will in every way meet modern traffic conditions, and afford the road user immunity from the alarming menace of slippery roads.

There can be no doubt that the activities and work of the Association have materially improved the position of road tar, and the Managing Council are of opinion that the amount of labour and money which has been expended during the year under review has been of substantial benefit to the tar industry.

I do feel, however, in concluding my address, that I must impress upon all the necessity for an ever-increasing effort to improve our product, and, by improved methods of distribution and more intensive propaganda, to increase the amount of road tar used on the highways. Surely it is not too much to ask that a Government, pledged to the reduction of unemployment and the assistance of the basic industries, should bear in mind when executing its programme that it has in home produced tar a material which is produced in sufficient quantities to meet all the demands that can and should be made upon it. We ask in fact that British tar should be used more and more on British roads.

SIR LAWRENCE WEAVER'S ADDRESS TO THE "B.C.G.A."

Salesmanship in the Gas Industry.

I have listened to Lord Eustace Percy's address with the greatest interest, and this conference is fortunate to have provided the platform for such a statesmanlike pronouncement on education. The implications of it were so many that I, for one, do not follow them all; but when we see the address in print we shall realize what a remarkable contribution has been made to-day to elucidate the educational problems of this country.

I am a Bristol man, and during the morning my mind wandered back to that area at the top of Park Street which is now dedicated entirely to education. There now stands the great building of the Bristol University, and I do not know why, possibly with a certain perversity, my mind wandered back to the time when the site was not so occupied. There used to come to that spot Hengler's Circus, and as a boy that pleased me more than anything else in Bristol. I remember well how every year there were new and great attractions, such as a luscious looking lady who leaped with great agility through a paper hoop, or else some marvel of skill or strength in the way of a man who juggled or acrobatted. There were, however, always two permanent officials. There was the ringmaster who cracked his whip, which did not really hurt anybody, because it was just part of the attractive amenities of the circus. Also there was always the clown, who somehow always got rolled up in the carpet when they were moving it between acts. I cannot help feeling there is a kind of allegory in that. Mr. Goodenough is the ringmaster, who for eighteen years has so charmingly cracked the whip, while I am in some danger of becoming the clown who gets rolled up in the carpet.

Salesmanship in the Gas Industry.

Let me say with regard to the craft and technique of salesmanship that it seems to me a thing of real importance, and no great British industry has shown itself to be more alive to the need of skilled salesmanship than the gas industry. It is fair to say that the Association is notable for its employment of all proper aids for the enlargement of the great industry which it serves. I know, therefore, that anything I may say will fall on sympathetic ears when I urge that knowledge of the craft and technique of the industry in which a man is a salesman is of an importance not to be neglected. That sounds, I am sure, very obvious; but I do not think it is as obvious to some people as it sounds.

We all know that salesmanship requires personality, probity, and a complete knowledge of all those commercial transactions which are bound up in the method of getting a commodity or a service from the producer to the ultimate consumer. The ideally perfect salesman would be the perfect man on all counts, and not merely the skilful persuader of consumers. I am here to suggest that the arts of the salesman might be improved by knowledge which is outside the range of mere business relationship. I do not think it enough that a salesman should take from a producer an article or service, and pass it on to the consumer without knowing how it came to be created, and relying on his statement as to its value and efficiency. It is not enough to know just enough to enable the article to be sold. Nothing that there is to be known about it is superfluous knowledge for the salesman. Every industry has its own history that can be set against the background of social and political history; and the gas industry has 117 years to look back upon. Every industry has a history of scientific and technical development; and if you do not know it, you cannot properly visualize its future development. Many industries have an æsthetic history. Certainly the gas industry has one in relation to the appliances it uses, and that history must be studied if the æsthetic appeal of gas is to be developed. Every industry has an economic history related to cost of production, cost of use, maintenance, and so forth. How can these costs be reduced if the history of their rise and fall is not known?

Now it is the business of the salesman to study these phases of industrial and commercial history, because a knowledge of them will increase his grip on future developments which he ought to be able to discuss with consumers. And more, the salesman is the link between the technician and the consumer. He can let the research worker and the engineer know what people want because he knows how far they are dissatisfied with what they have.

Despite the high level of salesmanship in the gas industry, there is much still to be done. As trustee of considerable charities charged with the duty of spending about £200,000 in building small dwellings in the next two years, I have had to study very closely the economics of hot water supply, and I have been examining the cost of providing hot water in small homes. But I have had considerable difficulty in getting specific data as to working costs. I have got some of them, but only by persistent digging. That work ought to have been done for me, and should have been available in a simple form. I know the difficulty that exists of giving consumptions per annum for any particular piece of apparatus, as against the much easier (though not absolutely simple) question of consumptions per hour, because the former are determined by the habits and customs and circumstances of the individual user, and therefore vary within relatively wide ranges of maximum and minimum. But the prospective user ought to find available for him a definite range of data based on practical experience which would be a guide to him. The skilled salesman

would, of course, adequately explain the reasons for anticipating variations in consumption according to varying usage, and would exercise proper caution and judgment so as not to be faced afterwards by a charge of under-estimating costs. But I think the gas salesman has been rather too cautious in this respect. Many people would not have taken the trouble to dig as persistently as I did in the face of over-cautious salesmen, and might therefore have come to a wrong decision, to the loss of the gas industry.

I am not now speaking as a person who knows something of the gas industry and as a friend of the gas industry, but as a Trustee and potentially a very large consumer. I am going to build something like 250 houses, and I want to equip them exceedingly well, and I want to know about the performance of the equipment that I am going to put into them. Other industries are not so reticent or so acutely cautious as many gas salesmen seem to be—or it may be that they are not quite so modest as the gas industry.

Mr. GOODENOUGH: Perhaps they are not quite so honest.

Sir LAWRENCE WEAVER: That may very well be the case; but at all events I suggest that the endeavour should be made to set down on paper, as far as may be, results which are ascertained results and which can be supported by facts about which there can be no discussion afterwards. I have found, in discussing this matter with the architects I know, that none of them had the information which I set out to get for them. If they had not got it—and they are very distinguished architects—then a great many other people have not information which it is advisable should be made available to them.

KNOW WHAT YOU ARE SELLING.

I started out to plead for a knowledge of technique and craft as an aid to salesmen, and I hope that you will not think me a detestably egotistical person if I speak from my personal experience. I was an ironmonger's bagman when I started business as a youth of 19, and carried a black bag containing pieces of more or less attractive ironmongery, which was very heavy, up and down stairs, calling upon architects, and trying to sell to them. It was a laborious job, and I did not like it very much. I had only been trained for it to this extent, that I had a training in draughtsmanship which enabled me to understand an architect's drawing when it was put before me. Many of the salesmen then operating in the ironmongery business could not do as much as this, so I scored to that extent. I found that architects were on the whole educated, intelligent, and pleasant people, but they had a great many salesmen calling upon them, and they were apt to put this rude notice on their doors: "Travellers will not be seen except by appointment," and they never gave an appointment! Therefore, I was a good deal hindered in building up a new business. I had started a London office for a provincial firm with no customers at all, and a notice of that sort was discouraging. I came to the conclusion that I could not hope to break down this difficulty of getting in to my potential customers unless I had something to tell them that the other fellow had not. I also perceived that there were a number of ill-designed things which were the only things available to architects in certain branches of ironmongery—such, for instance, as rain-water heads. At that time they could only be got from one highly intelligent firm which supplied beautiful rain-water heads, for which they charged enormous prices. Therefore I conceived the rather obvious idea that, if I could sell rain-water heads of decent design at a comparatively low price, I might start a business where before there was no business at all. I also felt that, unless I had something to tell architects which would be worth their listening to, I should not have a dog's chance. So I sat down and studied the history of the rain-water head in England. I do not want to boast, but to-day I can claim to be still the authority on rain-water heads! For that work I was elected a Fellow of the Society of Antiquaries in London at a very early age because of the work I did in the archæology of the rain-water head. I did that partly because the subject was fascinating, but also because I wanted to sell rain-water heads. I believe that by reason of the credit I got from publishing 53 articles in different illustrated papers in England and America, afterwards incorporated into a book, I got a certain measure of acceptance from the people up whose stairs I walked with my black bag, which otherwise I should not have got. If I had any success at all as an ironmonger's bagman it was in virtue of knowing something more about rain-water heads than other ironmonger's bagmen who went up the same staircase. I had no other training for the job except the natural desire to make a success of the job I was doing. I apologize for giving you a personal example, but now let me give you another example which is not personal to myself.

EXAMPLES OF SUCCESSFUL SALESPEOPLE.

I was lately asked to advise on the choice of a lady to be manageress of a pottery shop—a smart and attractive pottery shop in the West End of London. I was asked to interview one or two of the people who had offered themselves for the post. I conceived that a person to sell pottery effectively must know something about pottery and not be merely a persuasive and attractive person, though, of course, the more attractive the lady the better for her and the more pleasant for her customers. But there must be knowledge even in attractive people. One lady came to me and said she was anxious to take over the management of this shop where beautiful pottery was to be sold, and I said, "What makes you think you can sell beautiful pottery?" She replied, "Well, I was at the head of the fancy goods department of so-and-so's store." I said, "Very good, and I believe you held that job for two years." She said "Yes." "Well," I said, "you must be almost sack-proof; but what makes you think you can sell pottery?" To that she replied: "I have always been keen about pottery, and I have acted as a pottery assistant in a well known store. I went in as a junior, but I thought that if I was going to sell pottery properly I had better go to the London County School of Pottery to make pots myself; and I attended three nights a week for two years. I was not satisfied with that, so I worked in a country pottery for three months to see all the conditions of the business, the rough side as well as the pleasant side, and," she concluded, "I want to be manager of your shop." I said, "You have got the job." That seemed to be a stout-hearted woman; and I may tell you that her returns are going up every week. The shop was only opened in July, and it is now very nearly on a self-supporting basis—and that is because she knows her job. She can talk with intelligence and enthusiasm to everybody who comes in about pottery. She loves pottery; she has made pottery; and that is why she is a success as a saleswoman. She has taken the trouble to learn all her job.

May I give you another instance. Some of you may know that I was Director of United Kingdom Exhibits at Wembley. In connection with the task I had set myself of establishing at Wembley a greater measure of decorative unity than had previously been achieved at an English Exhibition, I went to Munich and Gothenburg to see the great exhibitions held there in 1922 and 1923, to see the decorative beauty of the settings. When I saw these exhibitions I felt that I had got into a new world. Nobody gave me such persistent and loyal backing in this matter of co-ordinated decoration at Wembley as the gas industry and Mr. Goodenough. One of the matters that concerned me very much was the subject of lettering. I felt that if we could avoid beastly lettering, we should get rid of a substantial amount of permanent ugliness.

There was a certain man named Harris, who called himself "The Sign King." He came to me and said, "I want to do all the sign writing at Wembley." I said, "That is a very laudable ambition, but tell me the reason why." Harris said, "I did all the sign writing at the White City," and he then reeled off a large number of exhibitions at which he did all the sign writing. I then said, "But this is going to be a rather different Exhibition, Mr. Harris. It is not going to be a White City, and will you tell me what sort of lettering you do?" He said, "Oh, I do all the best lettering." I asked him what types of lettering he did, and that I did not care about the quantity of lettering he had done. Harris said he did not know what I was talking about, but promised to bring some specimens. In a day or two he turned up again with a car full of samples, and they were spread out in my room. Harris was a perfectly delightful fellow and a great optimist, and thought everything he did was perfect—a wonderfully good start for a man. I said to Harris, however, "I never saw anything so foul in my life, and what is more, I can promise you that under no circumstances that I can possibly imagine will you do a single piece of lettering for Wembley." Poor Harris was seriously grieved and cast down; and he said in effect, "What am I to do to be saved?" I told him that the technique of his lettering was admirable, but the character and design of it abominable. Harris looked at me, and I could see he thought either that I was a lunatic or that there was something behind it not quite fair, and that I had already promised the contract to somebody else. I then said to him, "Have you ever seen the Trajan Column?" He asked where it was. I said in Rome, and that it was covered with the best lettering in the world. Harris said, "Well, you do not want me to go to Rome to copy the lettering, do you?" and I said, "No, if you go to the Victoria and Albert Museum you will there see a full size model of the Trajan Column at Rome correct in every particular, and you can copy the alphabet and teach your men how to do that alphabet. Then we may be very happy to give you a share of the lettering for the Wembley Exhibition." Harris said, "Well, really, I never heard of Trajan's Column before." I could see he still thought me a lunatic, so I suggested he should secure one of the best lettering experts to set out an alphabet from the model in the Victoria and Albert Museum. I promised him that I would make that the official alphabet for the Exhibition, and I did.

Harris went to Mr. Herrick and got the alphabet done. Then Harris did one of the best pieces of salesmanship which I have come across. He was so pleased at having achieved this piece of education that he circulated the alphabet not only to every exhibitor in the British Empire Exhibition with the news that it was to be the official alphabet, but he also sent a copy of the alphabet to every other signwriter in London and said in effect: "I do not want to get away with this, because I have been told what is the best alphabet. You can make

what use you like of it. I am teaching my signwriters how to do this lettering, and you can do the same." That was a very sporting act. Harris is unhappily dead, but a year or so after this happened he told the story at a dinner of the Incorporated Sales Managers' Association where I happened to be a guest, and said that what I had told him was one of the best pieces of artistic and business education he had ever had. Harris had really never been educated for his work; he had grown up in the business, and he told me that it was the first he had known about one alphabet being really different from another, or that one alphabet was better than another. There was evidently, said Harris, a history of alphabets, and something to be learned about them which he had not known before, and, incidentally, it had added to the prosperity of his business. That was a handsome acknowledgment of the importance of a knowledge of the art and history of the craft he was engaged in. Similarly I suggest that there must be a thousand interesting things about the gas industry which the young salesman ought to know and would be very interested in getting to know. There must be a vast amount of knowledge locked up in the memories of the experienced men of the gas industry which should be handed on for the benefit of the salesmen and, incidentally, the industry.

Salesmanship of an article or service must be envisaged in its relation to all human activities and, thus seen, becomes not only an occupation bringing a livelihood, but a great human pleasure and a study worthy of the best we can bring to it. The technical, the economic, and the artistic sides of the gas industry have a historical background which the salesman dare not ignore. By grasping their implications and their relations to current practice and future developments, the salesman puts himself in the position of interesting the consumer as well as informing him. It is not enough that a salesman should answer to a technical or economic or artistic question, "I'm sorry, I do not know. I will find out and let you know." That is to postpone the opportunity of securing a favourable decision, an opportunity that may not recur. Meanwhile a salesman in some competing industry may have answered the question in another way. The acquisition of the knowledge that enables the salesman to answer questions there and then is not a burden, but a delight. It gives a sense of efficiency and mastery that is its own reward.

MIDLAND ASSOCIATION OF GAS ENGINEERS AND MANAGERS.

The Autumn General Meeting of the Association was held last Thursday afternoon, in the Imperial Hotel, Birmingham—Mr. C. M. D. BELTON, of Shrewsbury (the President), in the Chair.

The HON. SECRETARY (Mr. Arthur Roberts, of Hereford) intimated the receipt of some apologies for absence, and read the minutes of the annual and spring meetings, which were confirmed.

The PRESIDENT remarked that, before proceeding further with the business of the meeting, he would like to express the pleasure of the members at having with them Mr. C. S. Shapley, the President of the Institution of Gas Engineers.

Mr. SHAPLEY said he had been delighted to accept the invitation to attend the meeting. He had done his best to be present at the meetings of the various organizations of the industry during his year of office, to get into closer contact with the members than was otherwise possible. The Council of the Institution, in their wisdom—and he thought it was wise—had decided that there should be an autumn meeting, the object of which would be purely business in the direction of research. He thought this would be all to the good, because the various research reports had not, he was sorry to say, in the past had the consideration which they deserved. Other Institutions, like the Civils, Mechanicals, &c., met many times a year; and he could foresee the time when their own Institution would have to meet more often than bi-annually. The business was growing; and the research necessitated by competition made it all the more desirable that members of the Institution should devote more time to that side of the business. The important influence of residuals on the balance-sheet was well known to all of them; and falls in value must be reflected in the price of gas. They had had research to improve, if possible, the market value of tar; and a lot of work had also been carried out in connection with the blending of coal. The latter was fraught with numerous possibilities.

LOSSES.

The PRESIDENT said that since their last business meeting they had lost three members. There was Mr. Charles Hunt, who passed away on March 30, at the age of 86, and who was the Association's first President. Mr. Hunt was a prominent gas engineer, not only in the Midlands, but throughout the industry. Mr. H. H. Everest, who had for many years been Resident Manager of the Whittington Gas-Works, died in April. He was a member of the Association for some years. They had also lost Mr. J. N. McColl, of Halesowen.

NEW MEMBERS.

A ballot was taken, and it was announced that Mr. Charles H. Taylor, Engineer and Manager of the Swadlincote Gas-Works, had been elected a member of the Association.

PRESENTATION OF CERTIFICATES.

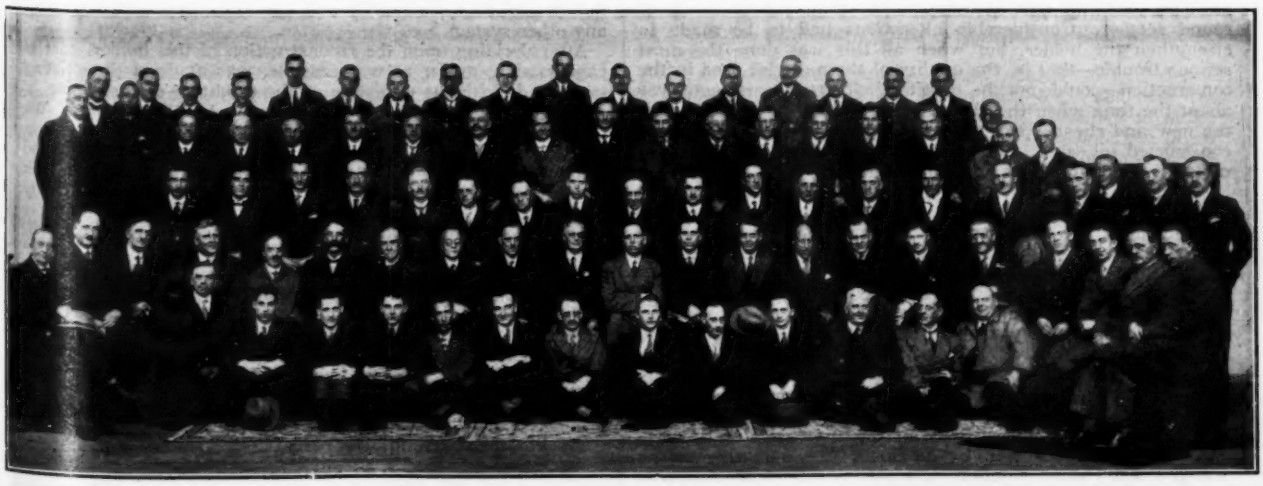
The next business was the presentation of certificates to four successful candidates in the Higher Grade Examinations in Gas Engineering and Gas Supply. They were as follows:

A. W. Elliott, of Shrewsbury, 1st class, Gas Engineering.
J. C. Cotteril, of West Bromwich, 2nd class, Gas Engineering.
R. Armitt, of Wolverhampton, 2nd class, Gas Supply.
C. T. Evans, of Wolverhampton, 2nd class, Gas Supply.

OFFICERS FOR THE ENSUING YEAR.

President.—Mr. A. Bird, Bromsgrove.
Vice-President.—Mr. H. J. Woodfine, Wellington.
New Members of Committee.—Messrs. A. A. Leonard, Iron Bridge; J. P. McCrae, Derby; and C. H. Webb, Stourbridge.
Auditors.—Messrs. S. Sadler, Solihull, and W. Wilson, Burton-on-Trent.
Hon. Secretary and Treasurer.—Mr. Arthur Roberts, Hereford.

Mr. FRED. DAVIES, of Walsall, then read a paper on "The Replacing of a Lattice Column Gasholder by One of the Spiral Type." This will be found on later pages of the "JOURNAL."



MANCHESTER JUNIORS AT THE WORKS OF GENERAL GAS APPLIANCES, LTD.

REPLACING A LATTICE COLUMN GASHOLDER BY ONE OF THE SPIRAL TYPE.

By FRED DAVIES, Engineer and Manager to the Walsall Corporation Gas Department.

[Paper before the Midland Association of Gas Engineers and Managers, Nov. 7]

I propose to make the gasholder now being constructed at Walsall the subject of this short contribution, dwelling more particularly upon the circumstances which led to its erection, and on some details of its construction.

As regards the old holder, this was constructed about the year 1897, and was the latest of our four holders. It partially failed some fifteen years ago, due to weak design and indifferent material incorporated in its construction. The inherent weakness in the design necessitated frequent adjustment of the crown guide carriages to maintain the container in a level position; and, even with constant adjustment, the holder was always more or less out of level. The weakness was apparent throughout the whole of its design, top curb, crown sheets, cups and grips, lattice columns, and girders.

Originally there were no wind ties on the top of the lattice columns, which allowed them to get out of plumb, with the consequence that any adjustment made to the top carriages was nullified when the wind changed from one direction to another. The diagonal bracing between the columns and girders was of weak construction, necessitating constant attention; the jointing of the girders to the lattice columns themselves was particularly ineffective, and had to be considerably strengthened.

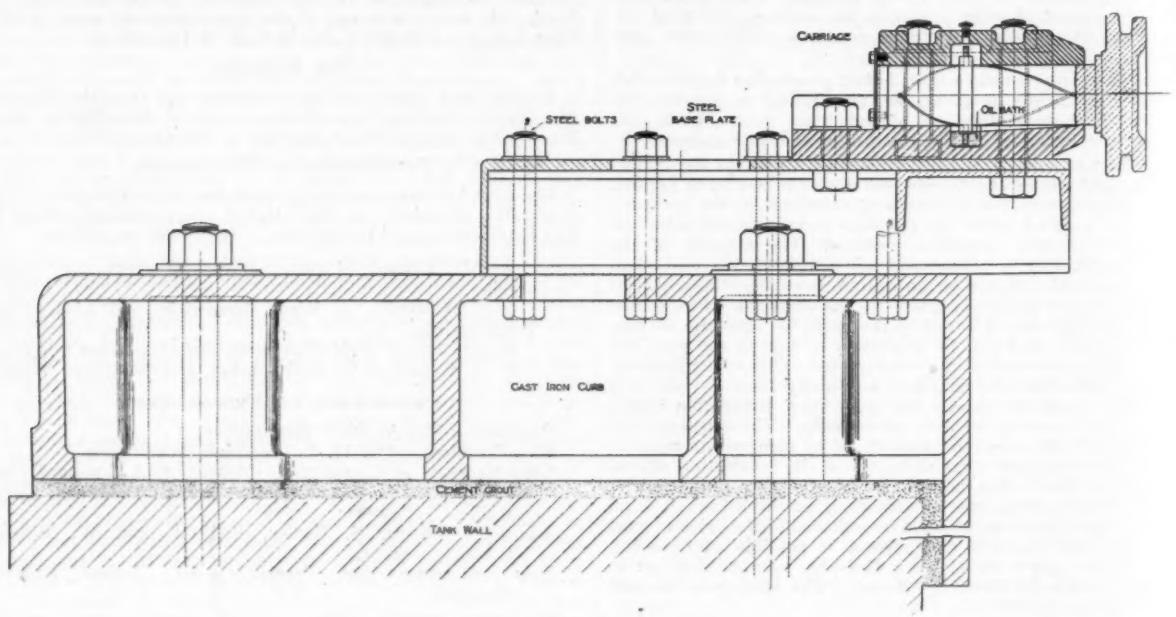


FIG. 1.

As regards the holder itself, the construction of the roof framing was most extraordinary, inasmuch as there were no members incorporated in the structure capable of taking a compression load, all roof members other than rafters being of round section. Considerable alterations had to be made to strengthen the holder, but when all this was done the most serious trouble—that is, the quality of the material used in the construction—could not be rectified. Thirty years ago was about the time when the change from the old wrought iron to the new and cheaper steel was made; and, as this holder was constructed of steel, this may account for the indifferent material which found its way into the structure.

As can be imagined, a holder of 1½ million c.ft. capacity, giving a pressure of 50 tenths when fully inflated, could not possibly meet the requirements of to-day. As a contrast between the design of the old holder and the new one, I may tell you that the old holder with guide framing and girders weighed only 375 tons, whereas the new holder alone will be upwards of 650 tons, and throw a pressure of about 15 in.

It is, of course, very easy in the light of present-day knowledge and experience adversely to criticize earlier designs. It must be borne in mind that the old holder was erected during that period of light pressures, and something must be said to the credit of those engineers who in that day carried out such pieces of engineering work without the knowledge and experience available to engineers of to-day. There is another matter which I feel I must mention, and that is the workmanship in the old holder. I can pay a tribute to the workmen of those days when I say that an examination proved the workmanship in the holder to be excellent.

DECIDING UPON A NEW HOLDER.

When deciding upon the type of gasholder to be erected, I naturally gave consideration to all the known systems, and ultimately came to the conclusion that the spirally-guided system was the best adapted to the existing circumstances. Had the old guide framing been sufficiently strong and well-preserved to allow for extension, I should, of course, have been tempted to replace the existing holder with one of the guide-framed principle with another lift added, but the weakness of the old guide framing rendered this an impossible proposition. Consideration was next given to the erection of a column-guided holder, which proved more expensive to construct than the spirally-guided type, and certainly more expensive in upkeep. The tankless holder was also considered; but, seeing that we already had a tank in existence which had given us no trouble, this system proved much more expensive than a spirally-guided gasholder, and also more expensive in upkeep. In addition, I should have had to construct a foundation for the tankless holder in the existing brick tank, which would have been a further additional cost, as no such foundation was required for any other type of holder erected in the existing tank.

You will see from this that the spirally-guided principle was undoubtedly the cheapest form of construction, and the type that would be more readily and economically maintained than any other system.

After deciding upon the reconstruction of this holder, careful examination, as far as was possible, was made of the existing tank, and, with the exception of the condition of the coping, it appeared to be a very soundly constructed piece of work. We had never been troubled with leakage, and the only defect in the tank appeared to be that it was slightly out of round, and somewhat out of level. It was decided that, when the tank was emptied, the walls should be critically examined, and any eroded brickwork replaced during the alterations. I may say that this examination has already taken place, and the condition of the tank has proved excellent.

The laying down of a new holder in an existing tank presents some difficulties in the design which are not present when an entirely new job is being contemplated. These difficulties were enhanced by the fact that the tank itself was not round, nor the coping exactly level. In view of the fact that a spirally-guided gasholder depends entirely, when fully inflated, upon the tank carriages to maintain its equilibrium, some alteration to the usual form of construction must take place in order to provide:

(1) A perfectly round tank curb.
(2) A perfectly level seating for the bottom roller carriages.

Upon considering these two defects in the tank, I decided to

take down as much of the eroded portion of the existing tank wall as was necessary to level it, and then erect a cast-iron curb about 12 in. deep constructed in box girder form. The cast-iron curb is made perfectly circular, and of a diameter to suit the smallest diameter of the tank. This curb has an apron plate which projects down the face of the wall about 1 ft. Fig. 1 shows details in cross-section of this cast-iron girder. After it is erected perfectly circular and level, it will be filled-in with a grouting of granite chippings and cement, the top courses of the existing tank wall being roughed to form an efficient key. This filling adds materially to the strength of the girder, and effectively prevents any risk of internal corrosion. The construction has the further advantage of acting as a shield, preventing any foreign bodies, such as coke, &c., being blown down or accidentally finding their way into the gasholder tank. The formation of the apron plate depending from the cast-iron girder circularized round the existing tank adds considerably to the strength of the construction, and makes the stability of the final structure almost entirely independent of the existing holding-down bolts.

It has the further advantage of evenly distributing the strains and stresses of the holder over a large surface of the tank curb, and avoids what is sometimes unavoidably present—viz., localizing the strains over a few feet of the tank coping. I did not, however, feel justified in considering that the cement rendering would form an indestructible connection between the cast-iron coping and the tank, so I used the holding-down bolts, which supported the old columns, as an anchorage for this girder, and, in addition, provided wrought-iron straps fixed between the existing column bases, securely anchoring the girder into certain of the existing stones, 8 ft. or 9 ft. below the coping which supported the old tank guides.

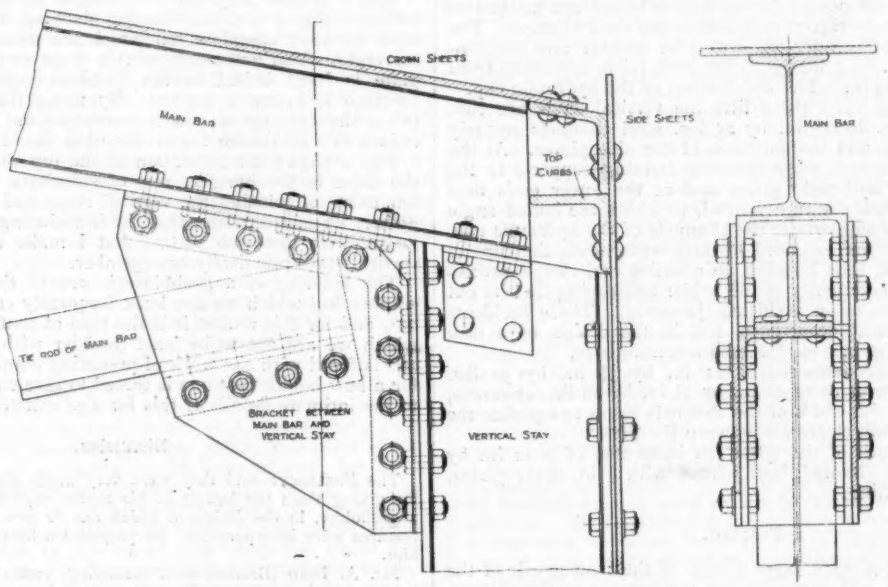


FIG. 2.

This girder, when fixed, forms a perfectly satisfactory top curb for the tank; it corrects any inaccuracy of the radial dimensions, and provides a perfectly level bed for the carriages. In addition, it overcomes any weakness that there was in the top of the old tank. This cast-iron curb directly supports the tank carriages, to which they are bolted with steel bolts, with the usual allowance for adjustments. I have dwelt somewhat at length on this girder, as I believe it to be, if not unique in spiral gasholder construction, at any rate unusual; and, while such a construction is more costly, I am of the opinion that the advantages more than warrant the expense involved.

Inlet and Outlet Pipes.

As it will be necessary to work the gas both in and out of the holder practically at the same time, I decided to alter the existing inlet and outlet pipes (which are now close together) and avoid sending the gas to the town practically direct from the inlet pipe. At first, I decided to carry the inlet pipe to the opposite side of the gasholder, fixing the pipe on the slope of the dumpling; but, on giving this matter further consideration, and to avoid interfering with the tank bottom, which, as I have said before, is now perfectly tight, I am taking the inlet pipe up the dumpling and introducing the gas right in the centre of the holder. The inlet pipe penetrates the centre pipe which supports the crown. Provision has, of course, been made in the centre pipe for the escape of the gas into the holder. This method of dealing with the inlet pipe gives us the advantage that the gas, upon admission to the holder, will not be subjected to such an immediate fluctuation in temperature as would happen with the inlet pipe near the side of the holder; the temperature of the water in the holder being naturally more constant in the centre than it would be round the edges. While the gas going into the holder will be subject to some change in temperature, it will not be so violent by this method.

Material Employed for Holders.

Having made the decision as to the type of holder to be erected, and settled all the details as regards the alteration to the existing tank, one's thoughts naturally turn to the material to be used in the gasholder. After much careful consideration and weighing-up of the pros and cons of wrought-iron, special alloy metal, or steel, I decided in favour of Siemens-Martin mild steel of British manufacture as being the most suitable and reliable material, for the following reasons:

(1) The first cost is less.
(2) The strength of the holder is much greater.
(3) The uncertainty of quality in wrought iron.

I am also of the opinion that steel sheets a gauge or two heavier than iron sheets will give as long protection against corrosion, and will undoubtedly give greater strength, and in my case the greater weight was a benefit because of the high pressure I required from the holder. Whatever material is used, proper steps must be taken to see that it is properly protected in the initial stages of its manufacture. I am convinced that, if this matter received adequate consideration, the loss by corrosion in steel structures would be very much less than it is, and a lot of our present-day troubles would be avoided.

It forms part of the specification for the Walsall holder that every part of the steelwork, including sheets, plates, and sections, shall have the mill scale removed from them by acid pickling. It is futile to put expensive paint on the top of this mill scale, which sooner or later detaches itself, when the inevitable corrosion at once sets in, and, what is more unfortunate, at the very point where it cannot be easily detected—viz., under the paintwork. Moreover, whatever paint is added, one obtains no protection.

After the plates and bars have been pickled—and, if necessary, scraped—and the whole of the mill scale has been removed, then they are washed, dried, and examined to make sure that the absolute metal is exposed. They are then given a coat of genuine red lead paint mixed with the best boiled linseed oil. After erection, the inside of the holder is to receive a further coat of red lead paint, and the outside a coat of priming paint, and finally two further coats of genuine pure oxide paint.

This painting may seem extravagant, but those who have had experience of the enormous corrosion that has taken place in gasholders during the last few years will, I am sure, agree that it is money well spent, and, as it is bound to ensure adequate protection of the material, it will save its cost over and over again as the years of the life of the holder roll by. I feel very strongly on this question of proper painting of structures; and every sheet and bar is being examined and passed before the contractors are allowed to put any work upon it.

Construction of Holder.

The crown of the new holder is supported by means of a trussed roof framing consisting of sixteen main rafters con-

nected at the centre of the holder to the central king post, and at the outer ends to the top curb and vertical stays; and of sixteen secondary rafters stretching from an inner circle of main purlins to the top curb, and connected thereto in the same way as the main rafters. The central king post is supported by sixteen main tension rods of 5 in. by 5 in. by ⅝ in. tee section, connected to the lower end thereof and to the top curb.

Each main rafter consists of an upper boom of 10 in. by 5 in. by 30 lbs. steel joist, supported by three struts of 5 in. by 4½ in. by 18 lbs. joist, bowstring tension bar of 5 in. by 5 in. by ⅝ in. tee, and diagonal ties of 5 in. by 3 in. by ½ in. tee section, and the secondary rafters are trussed with bars of similar sections. At the top of each of the two inner struts of the main rafter is fixed a circle of steel channels of 8 in. by 3 in. and 6 in. by 3 in. sections forming main purlins, and between the rafters are secured eleven circles of bracket bars of 2½ in. by 2 in. by ¼ in. angles.

The method of construction of the roof framing throughout is interesting in so far as it contains no forgings of any description, the whole of the work being cut from the ordinary standard bar, plate, or bent sections. No provision has been made in the roof principals or main tension bars for any adjustment, as the whole of the main and secondary rafters will be constructed off accurate templates, which will definitely ensure these members being similar to each other, so that the top curb will be exactly circular, which is a very important point in the design of spiral holders—much more so than in the case of guide-framed holders.

The top curb of the holder is formed of two 5 in. by 5 in. by ⅝ in. angles placed one below the other, the upper angle forming the connection between the crown and side plates. The angles, of course, form a continuous curb around the periphery of the holder, and have butt joints where necessary, arranged between the roof rafters.

Fig. 2 shows the design of the top curb and the method of connecting the main rafters to it and to the vertical stays. The vertical stays of the inner lift are 32 in number and are constructed of 12 in. by 5 in. by 30 lbs. steel joists extending from the top curb to 10 in. below the channel of the hydraulic cup.

In each of the other three lifts the vertical stays are constructed of 12 in. by 3½ in. by 25 lbs. steel channels securely bolted to the top and bottom rows of the side plates. At the upper ends are bolted angle brackets forming supports to the channels of the hydraulic grips, and at the lower ends they extend 10 in. below the cup channel, to which are bolted angle brackets forming supports to the channels of the hydraulic cup.

These brackets are extended inwards underneath the cups of the adjacent lifts, thus forming an effective and simple protection against the emergency of the holder telescoping its lifts out of their turn, due to an accidental jamming. These accidents are not of frequent occurrence, but in the design of a new holder it is wise to provide for such a contingency.

The cups are constructed of 11 in. by 3½ in. by 30 lbs. channels, and the grips of 12 in. by 3½ in. by 29 lbs. channels, the difference in the width of the channels being to equalize the amount of working clearance between the lifts.

The bottom curb of the outer lift is formed of a 12 in. by 3½ in. by 26 lbs. channel, butt jointed with ½ in. cover plates, with zigzag rivetting.

PLATING.

The foregoing gives a general idea of the framework of the gasholder, and I will now give you a summary of the plating. In the side sheeting of the lifts, the top and bottom rows are of ⅜-in. plate, and the adjoining rows, top and bottom, of ¼-in. The intermediate sheeting is of 9 S.W.G., and the skirting plates of the cup and grips are ⅝ in. thick.

In the sides of each lift are incorporated a number of spiral plates between the top and bottom rows of plates to which the guide rails are bolted. These plates are butt jointed with cover plates on the inside, to present a perfectly flat surface for the reception of the guide rails.

There are 16 of these rails fitted to the inner lift, 24 to the second lift, 32 to the third lift, and 40 to the outer lift. The rails are of a special section, specially rolled for gasholder guides, and weighing about 41 lbs. per yard, while the spiral plates to which they are bolted are about 12 in. wide by ⅜ in. thick.

The crown is plated with an outer row ⅜ in. thick, an adjoining row ¼ in., and a third row ⅜ in. The centre plate is ⅜ in. thick, with an adjoining row ⅜ in. thick; and the whole of the intermediate plating is of radial sheets of 8 S.W.G.

Considerable improvement has taken place in recent years in the design of roller carriages. The design of the carriages for the Walsall holder is shown in fig. 1. They are constructed throughout in steel, and are of the floating spindle type, self-lubricated. The roller itself is pressed on to a shaft, turned out of solid mild steel, and after pressing is electrically welded into position, so that it is the shaft that revolves in the type of carriage selected, and not the roller. Ample provision is made for the renewal of the lubricating oil when necessary. This, I think, is an advantage over the old method where innumerable grease caps have to be attended to, with the possibility of neglect in this direction.

It will also be noticed that the journals on the roller guides project in the direction of the guide rails, thus doing away, as far as practicable, with cantilever action on the spindles, to which the old type of roller guides were subjected.

The holder is of very substantial construction, and it will, I think, be of interest if an explanation of the apparent extravagance in the weights were explained, and the members informed that this holder is designed to throw a pressure considerably more than is usually expected in a holder of 2 million c.ft. capacity.

It was decided to have a pressure of 15 in. when the holder was fully inflated, for two reasons:

(1) This would do away with boosting at one of our small distribution stations.
(2) It would provide the necessary pressure into an 18-in. main recently laid round the southern portion of the borough, and permit of this being used as a feeder main without the necessity of boosting, and its attendant costs.

The pressure conditions on the district of supply have, during the last twenty years, undergone considerable alterations, and there is no telling what future generations of gas engineers will be called upon to do in this respect. Low-pressure holders are a nuisance; and I think it is desirable to have pressure to spare on the inlet of district governors, particularly in view of the circumstances prevailing at Walsall—*i.e.*, that the outlet mains from the gasholder are of somewhat restricted dimensions, and with our existing pressures are just about adequate to meet the requirements of our winter load.

The holder, therefore, was designed with a view to obtaining this pressure without added weight. Such methods of design leave an ample margin of safety. This extra weight was used to the best possible advantage to ensure stability of structure.

The diagrams prepared to illustrate the construction are as follows: Fig. 1 is a cross-section showing the cast-iron coping with the steel baseplate, on which are mounted the gasholder carriages. You will see from this diagram that the steel baseplate is itself bolted to the cast-iron coping, and then the carriage is mounted on top. By using the steel baseplate I bring the carriage so much nearer to the gasholder, and so reduce to a minimum the overhang of the axles.

Fig. 2 shows the formation of the top curb, the junction of the same to the hanging row of sideplates, and the method I am using of jointing the vertical stays and the main bars together. You will notice that, by introducing a channel form of gusset with two web plates, that I make the main bars and vertical stays practically one member.

The building of a gasholder is one of the branches of gas engineering which we are least frequently called upon to carry out, and for this reason it is the type of structure the details of which we are apt to be least familiar with. It is only when one is faced with the work of preparing plans and specifications for a new holder that one is forced to give careful consideration to the intimate details of this form of construction.

Discussion.

The PRESIDENT said they were very much obliged to Mr. Davies for giving them the benefit of his recent experience in constructing a gasholder, in the design of which one or two new and interesting features were incorporated. He proposed a hearty vote of thanks to him.

Mr. A. BIRD (Bromsgrove), seconding, remarked that the holder was a sound structure. It gave a good pressure, which was what was required at the present time.

Mr. R. S. RAMSDEN (Leamington) asked whether the author anticipated any difficulty in meeting the extra pressure thrown on the inlet side of the holder, and, if so, what steps he had taken to deal with it. In connection with the preparation of the materials by acid pickling, &c., was this done at the rolling mills or in the gasholder contractors' yard, and was it inspected?

Mr. DAVIES replied that they realized they would have difficulty with their purifier lutes, syphons, &c., when putting into commission a holder which gave 15 in. pressure, instead of the former 5 in. The water-sealed purifiers were converted to dry lutes; and they had naturally to increase the seal on the whole of the syphons on the works. The pickling was carried out at the contractors' works, in specially constructed vats. Provision was made that the contractors should let them know when each batch of steelwork had received treatment, and either he or one of his assistants went over and inspected the work at the contractors' plant.

Mr. F. C. BRIGGS (Dudley) said it was a difficult paper to discuss, though of great value. With regard to the pickling, he congratulated the author on the step he had taken. However expensive it might be, he was perfectly certain it was the right thing to do.

Mr. J. P. MCCRAE (Derby) inquired what solution was used for pickling. The very hefty sections used in various parts of the holder must have cost money. Had the author, as an alternative, actually calculated the cost of running a booster or compressor, as against the interest charges for the additional capital involved in this particular construction?

Mr. DAVIES replied that the pickling solution consisted of 10 p.ct. hydrochloric acid. As to the difference in cost, he had not gone into this, because he very much preferred to have the pressure in the holder than to have to boost. Boosting costs were sometimes difficult to arrive at. The holder had cost them altogether in the neighbourhood of £19,000, so it was really a comparatively cheap holder, in spite of its weight.

ECONOMIC VIEW OF THE SMOKE PROBLEM.

A Special Meeting of the Manchester District Institution of Gas Engineers took place at the Smoke Abatement Exhibition, Manchester, on Friday, Nov. 8, when Mr. W. B. McLUSKY, Engineer and Manager to the Halifax Gas Department, presided. Mr. R. H. Clayton, B.Sc., gave a lecture entitled "An Economic View of the Smoke Problem."

Mr. Clayton dealt with the work accomplished by the Manchester Air Pollution Advisory Board, who investigated the efficiency of the open coal fire. The investigation involved many years' work, and showed that the radiant heat evolved from bituminous coal in the ordinary fire was approximately 20 to 25 p.ct., whereas the radiant heat from coke was about 4 p.ct. higher, and from low-temperature fuel 10 p.ct. higher.

Heat losses in the waste gases passing up the chimney, and the amount of convected heat had been carefully determined by Fishenden. At a later stage, Sinnatt took up the work and determined, by very careful analysis of the flue gases, that up to 50 p.ct. of the heating value of the coal passed up the chimney. In burning coke the amount of unburnt gases was not so great, which probably accounted for the increased radiant efficiency of coke or other partly carbonized fuels.

It was not possible to ignore the emission of smoke from factory chimneys, which still persisted in most areas, and which, though more apparent than domestic smoke, was less objectionable, as it contained no tarry matter. The emission of such smoke was, in the case of mill chimneys, due to faulty methods of firing, and its diminution was a matter for the exercise of the powers of local authorities generally.

Manchester was now practically free from factory black smoke, though it was still troubled with domestic smoke, which was so light-coloured and so diluted with air that it appeared from the street level to be a minor pollution. If, however, it was drawn through a filter, its true character was noticeable. Sinnatt's work for the Air Pollution Advisory Board showed that, even after passing through two layers of double twill filter cloth, fine black particles remained in the filtered air, demonstrating the extremely penetrating power of the domestic smoke pollution. Unfortunately, Manchester could suffer from the black smoke produced by mill chimneys in outside areas. When Lord Newton's Committee of Inquiry sat at Manchester, he, the speaker, advocated a system of Government control for industrial smoke similar to that exercised by the Alkali Inspector for the prevention of stream pollution. By the adoption of such a system a fair and reasonable standard of working could be enforced on all industrial units irrespective of area.

SMOKELESS FUELS.

Smokeless fuel, in the form of low-temperature coke, for the past twenty years had been the subject of many company promotions. Personally, he had never yet accepted the glowing accounts of possible financial returns, and in this point of view he thought he was supported by the gas industry, having regard to the balance-sheets put forward, and taking what gas engineers considered to be the correct values for the products made and used. If, on the other hand, a carbonized product would appeal more to the community than the usual high-temperature coke, then the proposition had an invisible balance-sheet in which a profit on the lessened cost of living was set against any loss to the gas-works. This financial view could, of course, only be considered by the whole community, which would have to indemnify the gas department for any loss on capital or in working costs. He neither advocated nor spoke against low-temperature carbonization, but only used it as an example to illustrate methods of attacking the smoke problem.

Gas was limited in its use owing to its price. The gap in cost between coal heating and gas heating was too great to permit the householder to do more than use gas intermittently in place of the open coal fire. Might not schemes be evolved whereby domestic users would have an inducement to use gas in larger quantities? One could not ignore the psychological effect that systems of sale had upon purchasers, even though they might ultimately turn out not to show any special economy. It was almost a pleasure to see electric current being consumed at ½d. per unit, and gas at a much reduced price; for, having once paid the quarterly instalment on the Norwich system, one forgot it, and only visualized the current at the cheaper rates.

Very large sums of money were expended annually upon the purification of sewage, yet, financially, there was no return as regards the lowering of the cost of living. Sewage purification was a health measure, and the purification of a city's atmosphere should be regarded in the same light. For the purification of the liquid effluent of cities, local authorities used common funds; could not common funds be used to a much larger extent in the effort to bring about the purification of the air?

SUGGESTED ANTI-SMOKE ORGANIZATION.

Mr. Clayton further stated that he had visualized and drawn up schemes in the past on lines similar to those adopted in the purification of sewage—namely, an independent area organization, unfettered in its views, and supported on an independent financial basis (say, a levy, to start with, up to 1d. per annum of the population, which was a small sum compared with the £2 smoke tax at present indirectly levied). Such an organization would, in the Lancashire area, have a revenue of some £15,000, and such a department would cost a mere fraction of that of sewage organizations, and would probably be indirectly self-supporting by gains in increased distribution of smokeless heating agents supplied by cities. By such a method the indirect income for Lancashire at £2 per head per annum, due to lessened cost of living, would be £8,000,000.

Discussion.

Councillor WILLIAM MELLAND, J.P. (Manchester), said that Manchester had probably done as much as, if not more than, any other city in the country in attempting to eliminate the terrible curse of black smoke. There was hardly a house in the city in which a gas cooker, and, probably, a gas fire were not installed, and this was a really remarkable achievement in view of the fact that there were half-a-million people living in "two up and two down" houses. Unfortunately, many houses still retained a small open "Yorkshire" range, but, as a rule, in the summer time the fire was out. The Electricity Committee had done wonderful work in providing electrical power for industrial purposes. The city was also the pivot of the Regional Committee, which comprised, approximately, 120 local authorities who were studying the question of black smoke; and he believed there were also five other such organizations established in the country. Unfortunately, they were not yet statutory organizations. In some areas it was the domestic smoke which was the main source of trouble, while in others it was industrial smoke. One great advantage of using vertical coke in domestic fires was that it could be burned in almost any type of grate, though it certainly did burn better when there was an underneath draught. In his own home he used it in a "Devon" grate without any air passing underneath. "Coalite" was too expensive for many people to use, and, therefore, poor people would continue to burn coke, and its use would be greatly increased when people realized it could be delivered practically dry and free from sulphur.

Mr. W. J. SMITH, B.Sc. (Bolton), said that, if a gas authority could obtain approximately the same price for their coke as was paid for "Coalite," the price of gas could be reduced to such a figure that it would be more generally used for heating purposes.

Col. W. M. CARR (Stretford) was of opinion that a great deal could be done by the gas industry towards overcoming the evil of industrial smoke, though at present gas-making authorities were much hampered by the state of legislation restricting methods of charging. It would also be possible to cheapen gas to domestic users if the industrial field was developed.

Mr. A. L. HOLTON (Manchester) said it was only very rarely that complaints were received in regard to ordinary vertical coke used for domestic fires; it could usually be ignited without any difficulty whatever. The tendency was to ask for it in smaller sizes, for, with a large coke, there was too much free air passing through. About 1 in. to 1¼ in. sizes appeared to be preferred in the Manchester area.

Alderman F. J. WEST (Manchester) stated that a very great improvement had occurred in Manchester during the past forty years with regard to the emission of black smoke, and this was clearly reflected in the greatly reduced amounts of fines imposed by the magistrates in respect of smoky chimneys. He was of opinion that greater consideration should be given to systems of central heating. He had found, during a recent tour round the world, that the Americans, Canadians, and even the people of New Zealand were concentrating their attention upon methods of central heating.

Another speaker mentioned that a coke fire in his own house cost less than sixpence a day of fourteen hours' use.

Major RICHARDSON thought that coke should not only be graded, but that it should be more completely dried. Coke was washed in order to get rid of its impurities, but there was not much advantage to be gained thereby if it was left in such a moist condition that it would not burn. He spoke as one who had been out of the gas producing industry for some time and was now interested in another form of fuel.

Col. CARR said that, in the case of coke placed upon the market at the present time, both the moisture content and the ash content were very low, and could not now be seriously regarded as objectionable in any way.

GRADING OF COKE.

Mr. ARNOLD MARSH (Manchester) believed it might be possible so to standardize coke that, when it reached a definite quality of excellence it might be given a different name, thus tending to remove the objections of the average householder to its use.

Mr. F. G. SHAW (Buxton) said that a national grading of coal was necessary. When he was acting as Fuel Overseer during the war he took the trouble to sample every type of house coal that was sold within a considerable area. He found that at least half the coal sold as suitable for household purposes was entirely unsuitable. Many types of coal were sold under the names of seams which had long ago been worked out. He was satisfied that, when the economic

position improved, the working-classes would be more inclined to adopt gas heating methods.

The PRESIDENT said that the fuel sold in Halifax contained less ash in certain sizes than the coal itself. They had stopped selling "coke," and were now selling nothing but the new "smokeless fuel," and in one week they had distributed no fewer than 11,000 bags at 3d. a bag. He considered there should be at least one retail shopkeeper selling smokeless fuel to every 1000 inhabitants. In Halifax there were fewer than 100,000 inhabitants, and 103 such shopkeepers sold bags of smokeless fuel over the counter. Even people who were travelling home in motor cars would stop at the shops to buy some bags of it.

VOTE OF THANKS.

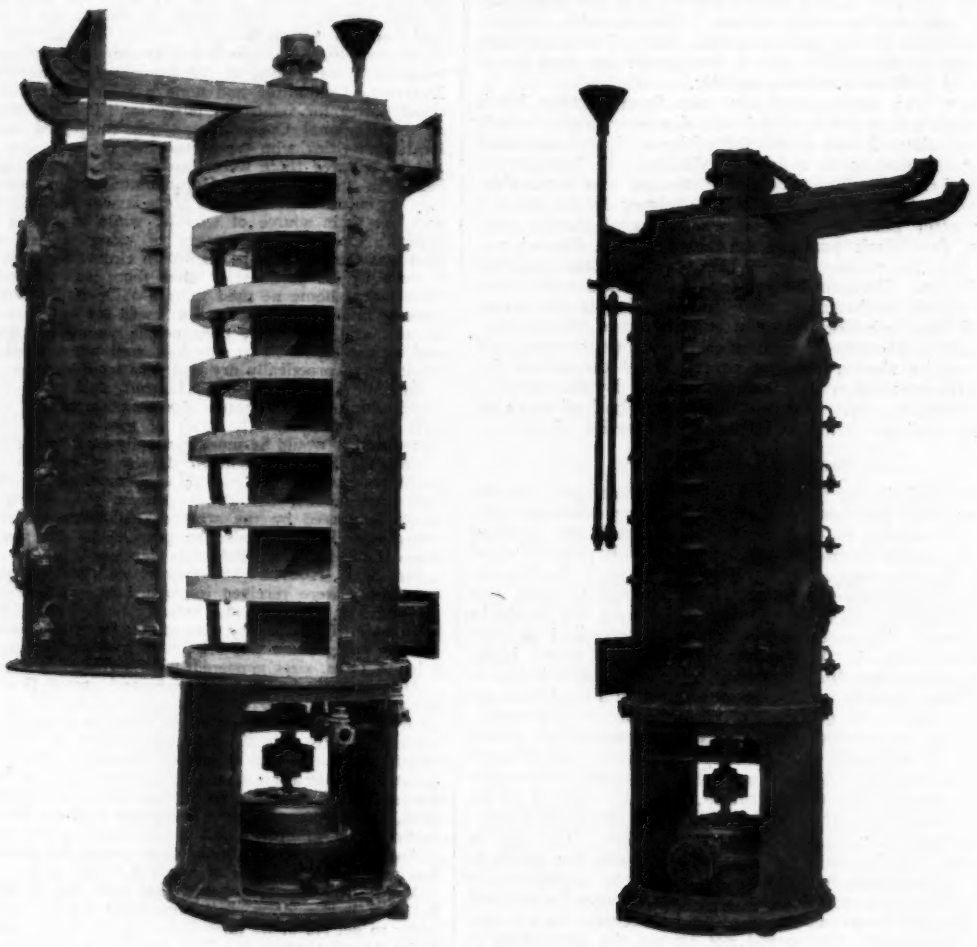
Mr. C. S. SHAPLEY (Leeds), President of the Institution of Gas Engineers, moved that a very hearty vote of thanks be accorded to Mr. Clayton for his lecture.

Mr. E. H. HUDSON (Normanton) seconded the vote of thanks, which was carried unanimously by acclamation.

Mr. CLAYTON, in responding to the vote, emphasized the necessity of awakening the citizens in urban areas from their state of apathy in regard to the smoke nuisance. The Air Pollution Advisory Board had now ceased to function, because they had completed the work allotted to them, which was to investigate the effect of the open coal fire upon the atmosphere. It was only by assiduously educating the general public that progress could be made in regard to smoke abatement. With regard to the ash content in coal, London would burn coal containing 10 p.ct. of ash, while a northern city like Leeds would not tolerate more than 4 p.ct. The only solution of the smoke problem, so far as the artizan was concerned, lay in the utilization of smokeless fuel; he could not afford to pay for any scientific apparatus to be installed in his house. The replacement of bituminous coal by coke depended very greatly upon the amount of ash which the coke contained. In Yorkshire the washing of coal had increased from 8 p.ct. to 46 p.ct. For some reason or other, the ash from coke appeared to be of a much finer nature than that from coal, and it was, therefore, much more easily blown about a room. If something could be done to make this ash less easily dispersive, then one of the main troubles of the housewife would be solved with regard to the use of coke.

Councillor MELLAND moved that a vote of thanks be accorded to Mr. McLusky for presiding, and the proceedings concluded.

SPIRAL CENTRIFUGAL SCRUBBERS FOR SMALL GAS-WORKS.



CENTRIFUGAL WASHERS AT WOLVERTON GAS-WORKS.

An interesting development has recently been made in the application of centrifugal washers to small gas-works up to half-a-million c.ft. capacity. These machines are extremely small, being only 12 ft. high and 2 ft. 6 in. in diameter, and are particularly noteworthy for their low initial cost, small power required to drive, and high efficiency. Recently machines of this description have been installed at the new Wolverton Gas-Works for the purpose of ammonia and naphthalene extraction; and the following results have been obtained. It will be seen that an extremely low water and oil consumptions are required to maintain a high washing efficiency.

Further particulars of these machines may be obtained from Messrs. Kirkham, Hulett, & Chandler, Ltd., Union Foundry, Mansfield.

Ammonia Extraction.

Quantity of gas	232,000 c.ft. per 24 hours
Temperature	73° Fahr.
Ammonia content, gas inlet	86·3 grns. per 100 c.ft.
,, ,, ,, outlet	1·3 ,, ,, ,,
Power consumption	1·67 H.P.
Quantity of water	0·35 gall. per 1000 c.ft.
Washing efficiency	98·5 p.ct.

Naphthalene Extraction.

Quantity of gas passed	234,000 c.ft. per 24 hours
Temperature	66° Fahr.
Naphthalene content, gas inlet	5·9 grns. per 100 c.ft.
,, ,, outlet	0·33 grn. ,, ,,
Quantity of oil in use	6 galls. per 1,000,000 c.ft.
Power consumption	1·67 H.P.
Washing efficiency	94·4 p.ct.

THE EQUILIBRIUM $CO_2 + C = 2CO$.

By F. J. DENT and JOHN WILLIAM COBB

[Reprinted from the Journal of the Chemical Society, September, 1929.]

From an experimental study of reactions taking place in the blast furnace, Schenck and Heller (Ber., 1905, **38**, 2139) concluded that the composition of the mixture of carbon monoxide and dioxide in equilibrium with carbon varied with the modification of carbon employed. Pring and Fairlie (J. Chem. Soc., 1912, **101**, 91) drew a similar conclusion after studying the equilibrium in the system carbon-hydrogen-methane.

These results, however, do not appear to have received much consideration from workers on the equilibrium between carbon and its oxides, and the contrary opinion—*viz.*, that there is only one position of equilibrium—has been repeatedly expressed, though it is noteworthy that the agreement between the results obtained by the different investigators is by no means good, as the following table shows:

The $CO_2 + C \rightleftharpoons 2CO$ *Equilibrium at* 800°.

Equilibrium Composition of Gases.		—
CO_2. P.Ct.	CO. P.Ct.	Observer and Reference.
7·0	93·0	Boudouard (Ann. Chim. Phys., 1901, **24**, 1)
13·1	86·9	Mayer and Jacoby (J. Gasbeleucht., 1909, **52**, 282)
11·4	88·6	Arndt and Schraube (Diss., Techn. Hochschule, Berlin, 1911)
13·85	86·15	Rhead and Wheeler (J. Chem. Soc., 1910, **97**, 2178)
9·95	90·05	Bodmer (Diss., Techn. Hochschule, Zurich, 1926)

The results obtained by Clement, Adams, and Haskins (Bureau of Mines, Bull. No. 7, 1911) are not given, as they were obtained by extrapolation and were not a direct determination of the system at equilibrium. The method of extrapolation does not appear justifiable, for the results obtained deviate considerably from those given above.

A variation in the carbon modification would be expected to influence the equilibrium, since the different types of carbon are associated with different amounts of energy, and as a result the heat of the reaction $C+CO_2 \rightleftharpoons 2CO$ varies. This heat of reaction for different types of carbon is shown in the following table, together with the corresponding calculated composition of the gases in equilibrium at 800°.

Type of Carbon.	Heat of Reaction* (Cals. per G.-Atom of Carbon).	Composition of Gases in Equilibrium at 800° (Calc.).	
		CO_2. P.Ct.	CO. P.Ct.
Graphite (natural)	41,810	13·8	86·2
Coke	40,490	8·4	91·6
Charcoal	39,480	5·6	94·4
Methane carbon (deposited at 800°)	38,300	3·4	96·6

* These figures have been calculated from the heats of combustion of carbon in oxygen obtained by Roth and Nikitin.

Such calculated compositions are only approximate owing to the lack of accurate specific-heat data over a wide range of temperature, but they serve to show that the variations are of the same order as those between the results of different investigators.

The work described below was carried out because of the absense of any satisfactory experimental measurements showing the influence of the carbon employed on the equilibrium in the system under discussion. All our determinations have been made at 800°; this temperature was chosen as being sufficiently high for the reaction to proceed at a fairly rapid rate, and sufficiently low for the percentage of carbon dioxide at equilibrium to be easily measurable.

The types of carbon we have used have been: (*a*) Coke, prepared by carbonizing at 800° a fusible Yorkshire coal (Sharlston Wallsend, from the Haigh Moor Seam), containing 35·8 p.ct. of volatile matter and very little ash (1·2 p.ct.); (*b*) graphite, a natural Ceylon product containing 0·4 p.ct. ash; and (*c*) charcoal, prepared by carbonizing coco-nut shell at 800°. In many experiments the rate of the reaction has been increased by the addition of sodium carbonate (compare Branson and Cobb, Gas Research Fellowship Report, Trans. Inst. Gas Eng., 1927), a procedure which has greatly facilitated this study.

EXPERIMENTAL.

The apparatus used was similar in principle to that employed by Rhead and Wheeler (*loc. cit.*), and is shown in fig. 1. The method consists essentially in continuously circulating carbon dioxide, and the carbon monoxide formed by its reduction, over coke kept at 800° in an electric furnace. The whole apparatus is sealed from the atmosphere, and the progress of the reaction is followed by observing the rise of pressure in the apparatus. It was assumed that the reaction had ceased when circulation for a number of hours produced no further change in the pressure. A sample of the gas was then taken and analyzed.

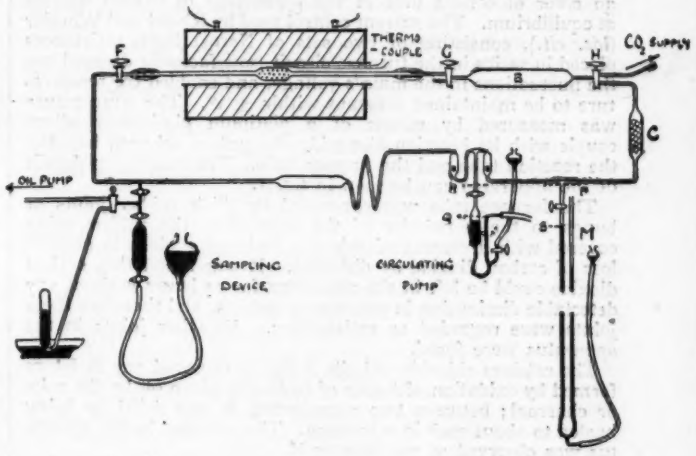


Fig. 1.

Special precautions were taken (*a*) to cool the gases rapidly after they had passed over the carbon, in order to prevent the decomposition of carbon monoxide; and (*b*) to maintain the carbon at a constant temperature throughout the experiment.

Factor (*a*) is especially important when the rate of the reaction of the carbon with carbon dioxide is slow—e.g., when catalysts are not being employed. In these cases, a furnace tube of fused silica of the type shown in fig. 2*a* was used. In the constricted ends, packed, after filling the bulb with carbon, with rods of silica, the cross-section of the free space was only 0·05 sq. cm., and consequently the circulating gases passed rapidly through the zones of decreasing temperature in the furnace. After an experiment lasting ten days, there were no signs of any deposition of carbon arising from the decomposition of

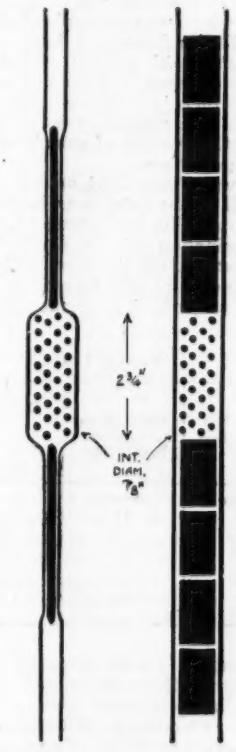


Fig. 2*a*. Fig. 2*b*.

carbon monoxide. When sodium carbonate was used to accelerate the reaction, a silica furnace tube could not be employed, but because of the much greater velocity of the gasification of carbon the very rapid cooling of the gases described above was not necessary. In such experiments, a tube of non-porous Morgan material was used, the free space outside the carbon column being packed with blocks of the same material. This arrangement is shown in fig. 2*b*. In all experiments, the carbon was graded $\frac{1}{8}$-$\frac{1}{10}$ in., and for each determination the amount used occupied a column $2\frac{3}{4}$ in. long and $\frac{7}{8}$ in. in diameter in the reaction tube.

The importance of the temperature factor (*b*) can be seen from the formula $Q \cdot dT/T = RT \cdot d \log K$, from which, by calculation, it can be shown that a variation of 1° at 800° causes an error of 0·1-0·2 unit in the percentage of carbon dioxide at equilibrium. The current control used by Rhead and Wheeler (*loc. cit.*), consisting of two sets of Nernst lamp resistances placed in series in the furnace circuit, satisfactorily damped out the fluctuations in the main's voltage, and enabled the temperature to be maintained constant within ± 1°. The temperature was measured by means of a platinum platinum-rhodium couple with its junction alongside the carbon column, between the reaction tube and the furnace tube. The remaining details of the apparatus can be seen in fig. 1.

The furnace tube was connected by thick rubber joints or bungs to the remainder of the apparatus, the rubber being covered with a cement of asbestos and water glass to prevent loss of carbon dioxide by diffusion. It was found that carbon dioxide could be left in the apparatus for 24 hours without any detectable diminution in pressure occurring, and therefore these joints were regarded as satisfactory. All other joints in the apparatus were fused.

The calcium chloride in bulb C (fig. 1) removed any moisture formed by oxidation of traces of hydrogen given off by the coke or charcoal; between two experiments it was dried by being heated to about 300° in a vacuum. The pressure in the apparatus was observed at manometer M.

Method.—A sample of the carbon under investigation, after being heated for 50 hours in a vacuum at 900° to remove the residual volatile matter, was packed into the reaction tube, and the whole apparatus was sealed and evacuated. The furnace temperature was then raised to 800°, and the apparatus was filled with carbon dioxide at a pressure of approximately 40 cm. of mercury. (This was chosen as the initial pressure in order that the final pressure should be approximately 76 cm., but it varied slightly. In the following account, however, all results are calculated to correspond with a pressure of 76 cm. in order to facilitate comparison.) Circulation was then commenced, and the pressure was observed every 30 or 60 minutes until it became constant, whereupon a sample of gas was taken.

Experiment 1.—The influence of heat on the equilibrium over coke impregnated with sodium carbonate.—A sample of coke was heated for 50 hours in a vacuum to drive off residual volatile matter, and then impregnated with sodium carbonate by boiling with a 10 p.ct. aqueous solution and drying at 105° By this means, 7 p.ct. by weight of anhydrous sodium carbonate was left on the coke surface.

The equilibrium was determined at 800°, and then the impregnated coke, still in the tube, was heated at 900° under a vacuum for 30 hours. The temperature was lowered to 800° and another determination of the equilibrium made. This procedure was repeated until the composition of the gases in equilibrium with the coke at 800° was not influenced by further heating of the coke at 900°. The results obtained are given in Table I.

TABLE I.

Determination.	Total Time of Heating at 900°.	Time Taken to Attain Equilibrium.	Composition of Equilibrium Mixture.	
			CO_2. P.Ct.	CO. P.Ct.
	Hours.	Hours.		
a	50	12	7·0	93·0
b	80	7	8·8	91·2
c	110	15	10·9	89·1
d	155	32	13·5	86·5
e	190	34	13·7	86·3
f	250	55	13·8	86·2

It is seen that heating a coke prepared from a fusible coal and impregnated with sodium carbonate causes the percentage of carbon dioxide in equilibrium with the coke at 800° to increase from 7 p.ct. to a constant value of 13·8 p.ct. The value obtained by Boudouard was 7 p.ct. of carbon dioxide, while the constant value of 13·8 p.ct. coincides within the limit of experimental error with the results obtained by Rhead and Wheeler at the same temperature; and it is noteworthy that the values obtained by other investigators lie between these two limits.

The hypothesis is put forward that the gradual alteration in the equilibrium composition of the gases (until the proportion of carbon dioxide reaches 13·8 p.ct.), which takes place when a coke is heated, is due to a graphitization of the surface of the coke, and that the variations between the values obtained by different workers are due to the different methods they employed to purify their coke or charcoal before use.

We have shown in other experiments (Gas Research Fellowship Report, Trans. Inst. Gas Eng., 1929) on the influence of heat treatment on the reactivity of coke that graphitization takes place most readily on the surface, where the atoms are in the most mobile condition. General graphitization of the whole coke substance with noticeable increase of the electrical conductivity only takes place with appreciable velocity at temperatures above 2000° (Ruff., Z. anorg. Chem., 1925, **148**, 313; Z. angew. Chem., 1925, **38**, 1164). In these experiments, however, only the surface in contact with the gases determines the position of the equilibrium, and the condition of the interior of the coke has no influence.

Experiment 2.—The equilibrium over graphite in the presence of sodium carbonate.—The equilibrium was determined over a sample of natural Ceylon graphite which, in order to accelerate the reaction, was first impregnated with sodium carbonate. The values obtained for the equilibrium gas composition in two determinations were:

(*a*) 13·85 p.ct. CO_2; 86·15 p.ct. CO.
(*b*) 13·45 ,, CO_2; 86·55 ,, CO.

The difference between the analyses is small, and could have been caused by a variation in the temperature of less than 2°. It is seen that the gas has the same composition as that in equilibrium over coke which has undergone a prolonged heating. The results confirmed the hypothesis that the effect of heating is to graphitize the surface of the coke.

Experiment 3.—The equilibrium over charcoal in the absence of sodium carbonate.—The influence of heat on the equilibrium over coco-nut charcoal was determined without the addition of any foreign substance such as sodium carbonate; this type of charcoal being chosen as a reactive form of carbon. The results obtained were as follows:

Charcoal No.	Time of Heating.	Heating Carried Out at—	Composition of Gas.	
			CO_2. P.Ct.	CO. P.Ct.
	Hours.			
1	22	850–900°	9·15	90·85
2	50	900	10·7	89·3
,,	+ 27·5	1000	11·0	89·0
,,	+ 48·0	1010	12·0	88·0

The results show that the influence of heating the charcoal on the composition of the gas in equilibrium with it at 800° was similar to that observed in Expt. 1 for Sharlston Wallsend coke impregnated with sodium carbonate, in that the percentage of carbon dioxide in the gas was higher the more prolonged and severe the heat treatment. It is noticed, however, that the percentage of carbon dioxide in the first determination over charcoal, viz.—9·15 p.ct.) was not so low as in the corresponding determination over the impregnated coke, viz.—7 p.ct.), even though the latter had undergone a more severe heating before these determinations were made. Comparison of the present data with those of Table I. shows also that the surface of coco-nut charcoal did not graphitize so readily on heating as that of the coke, and even after the charcoal had been heated for 75 hours at 1000°-1010°, the percentage of carbon dioxide in the gas at equilibrium was considerably less than 13·8—the value obtained in equilibrium over the coke after prolonged heat treatment at 900°.

These results are in agreement with those of other experiments we have made on the reactivity of cokes (*loc. cit.*), which have shown that, other conditions being the same, the more fusible a coal is during carbonization, the less reactive is the coke produced and the more easily is the surface of the coke graphitized by heating (see also Ruff, Schmidt, and Olbrich, Z. anorg. Chem., 1925, **148**, 313; Agde and Lynke, "Von den Kohlen und den Mineralölen," 1928).

It is believed that the sodium carbonate, which was present in Expt. 1, but not in Expt. 3, does not cause the surface to graphitize more readily at temperatures below 1000°; indeed, the results of other work indicate that its influence is rather the reverse. We take the view that, because of an affinity which exists between the sodium carbonate and the free valencies of unsaturated carbon atoms, the presence of sodium carbonate on the surface of the coke tends to prevent such atoms coalescing into an unreactive layer. Thus, there are present on the surface active atoms, which, in the absence of the stabilizing effect of the sodium carbonate, would rapidly condense with other carbon atoms into a less active state. As a result of this action, the percentage of carbon dioxide in the gases in equilibrium with coke when sodium carbonate is present, and when the heat treatment has not been too prolonged, is smaller than the percentage of carbon dioxide in the corresponding equilibrium over charcoal in the absence of sodium carbonate (see Expts. 1 and 3). This difference in the percentage of carbon dioxide at equilibrium is not caused by an inherent difference between charcoal and coke, since, in a determination of the equilibrium over charcoal after 50 hours' heating at 900° in a vacuum, and subsequent impregnation with sodium carbonate, the percentage

of carbon dioxide at equilibrium was the same as that initially observed over the coke impregnated with sodium carbonate—namely, 7 p.c.

Experiment 4.—The equilibrium over coke without the addition of sodium carbonate.—This experiment was carried out in order to ascertain whether the surface of the coke (Sharlston Wallsend) after 50 hours' heating at 900° is graphitic when sodium carbonate is absent. In this experiment the method was modified because of the slow rate at which the coke reacts with carbon dioxide in absence of sodium carbonate.

Mixtures of carbon dioxide and carbon monoxide containing from 7 to 14·2 p.c. of dioxide were circulated over the coke for a considerable time. By trial and error, a mixture was found which did not undergo any change in composition under these conditions. This mixture was taken as corresponding with equilibrium.

Three determinations were made on the same sample of coke in the order given in the following table. The gas analyses are corrected for any small residue, which was never greater than 0·75 p.c.

Determination.	Composition of Initial Mixture.		Time of Circulation (Hours).	Composition after Circulation.	
	CO_2, P.Ct.	CO, P.Ct.		CO_2, P.Ct.	CO, P.Ct.
a	14·2	85·8	110·0	14·0	86·0
b	9·9	90·1	66·0	12·2	87·8
c	8·3	91·7	162·0	10·5	89·5
Equilibrium gas composition corresponding with graphite				13·8	86·2

The results show that when the percentage of carbon dioxide in the mixture was a little higher than 13·8 (determination *a*), which corresponds with the equilibrium with graphitic carbon, the carbon dioxide content tended to decrease slightly, but was practically constant; when, however, as in determinations *b* and *c*, the percentage of carbon dioxide was less than 13·8, circulation caused an increase in the carbon dioxide content.

The results indicate that the surface of the Sharlston Wallsend coke, prepared from a highly fusible caking coal, is graphitic, in the absence of sodium carbonate, after 50 hours' heating at 900° in a vacuum.

Experiment 5.—The influence of gasification on the equilibrium over an impregnated coke.—The results of other experiments, carried out at about the same time as the work just described, indicated that the surface of a coke is not homogeneous; some of the carbon being more active than the remainder.

When the coke is heated in a stream of carbon dioxide, the most active portions gasify first, leaving a more unreactive residue, and, as a result, the reactivity of a coke generally decreases as gasification proceeds. It is believed that the most active carbon is composed of loosely combined atoms with free valencies and consequently a high energy content. Thus, the average energy content of the surface should diminish as the coke is gasified, and therefore it is to be expected that the compositions of the gas mixtures in equilibrium over the coke before and after partial gasification will be different. The following experiment indicates that this is so.

A sample of coke was impregnated with sodium carbonate after removal of residual volatile matter by 50 hours' heating in a vacuum at 900°, and the equilibrium was then determined over it at 800°. As before, the composition of the gas at equilibrium was CO_2, 7 p.ct.; CO, 93 p.ct. The temperature was then raised to 850°, and 1·7 grammes of the coke were gasified in carbon dioxide, passing at the rate of 5 litres per hour. The equilibrium was then re-determined at 800°, the composition of the gas being CO_2, 9·2 p.ct.; CO, 90·8 p.ct. After gasification of a further 0·8 gramme of carbon the equilibrium showed no further change. The composition of the gas at equilibrium was CO_2, 9·1 p.ct.; CO, 90·9 p.ct. These results confirm the view that gasification first removes preferentially the most active portion of the coke when it is impregnated with sodium carbonate, and after this portion has been consumed, the coke gasifies homogeneously without a further decrease in the average energy content of the carbon.

In order to demonstrate that the difference in the composition of the gas at equilibrium before and after partial gasification was due to the carbon and not to any alteration in the sodium carbonate, the coke residue from the experiment just described was reimpregnated with sodium carbonate, and the equilibrium again determined. The composition of the gas at equilibrium was CO_2, 9·15 p.ct.; CO, 90·85 p.ct.

CONCLUSIONS.

The results of the experiments described indicate that the nature of the carbon influences the equilibrium in the system carbon-carbon dioxide-carbon monoxide.

Values for the percentage of carbon dioxide in the gas at equilibrium at 800° and 1 atm. pressure vary from 7 to 13·8 p.ct., according to the carbon used and its pre-treatment.

It appears that 13·8 p.ct. of carbon dioxide corresponds with saturated graphitic carbon, and that the lower figures are obtained when carbon containing active unsaturated atoms is present.

The effect of gasifying an impregnated coke, which consists of a mixture of carbons having varying degrees of unsaturation, is to remove preferentially the most active unsaturated constituents, leaving a less active residue.

Heating a carbon containing unsaturated atoms with a high energy content gradually transforms these into more stable atoms corresponding with a higher percentage of carbon dioxide at equilibrium. Some types of carbon undergo this change more readily than others, and it is minimized by impregnation with sodium carbonate.

Owing to this effect of heating on a carbon, in a determination of the equilibrium over a carbon such as charcoal at a high temperature, if the gases were circulated for a sufficiently long time, the final equilibrium would be the same as that obtained over graphite. The final equilibrium so obtained cannot, however, be regarded as proper to the original carbon, and it is to be remembered that graphitization is a slow process compared with the gasification of carbon in industrial or domestic use.

We have taken the view that the presence of sodium carbonate is without effect on the equilibrium between carbon dioxide and monoxide over carbon, except in so far as it influences the nature of the carbon surface exposed to the gases, and that at a given temperature and pressure the equilibrium depends solely on the energy content of the carbon atoms on the surface. This opinion is supported by the results of Expts. 1, 2, and 5, which show that the composition of the gases at equilibrium varies with the type of carbon used and its pre-treatment, even when the amount of sodium carbonate present is the same, and also by the agreement of the results we have obtained, using (*a*) impregnated coke after a prolonged heating and (*b*) impregnated graphite, with those obtained at the same temperature by Rhead and Wheeler, using purified wood charcoal which had undergone considerable heat treatment.

The structure of the solid carbon formed by various decompositions and transformations has been the subject of several recent investigations, and the results are relevant to the present issue. Unfortunately, they differ among themselves. For example, Hofmann (Ber., 1926, **59**, B, 2433) concludes that charcoal is a crystalline carbon in which the crystals are very small, while Ruff and his co-workers (e.g., Z. anorg. Chem., 1925, **148**, 313) conclude that amorphous carbon as an individual modification is in better agreement with the influence of heat upon it, and that when charcoal is heated its properties do not change continuously to those of graphite, but in stages.

It should be noticed that, whereas Hofmann investigated carbons formed by deposition from the gaseous phase, Ruff's work was carried out on carbon prepared by the decomposition of a solid, which, during the decomposition, did not liquefy or vaporize. Thus, while it is conceivable that atoms in deposited carbons are regularly arranged in the graphitic lattice, it is equally conceivable that in charcoal prepared from a substance in which originally the carbon atoms are certainly not so arranged, a stage is passed through in which the substance can be rightly classed as "amorphous."

As the work of Hofmann (*loc. cit.*) showed that carbon deposited from carbon monoxide is crystalline, the size of the crystals and consequently the heat of combustion of the carbon varying with the conditions of decomposition, it is to be expected that the composition of the mixture of carbon dioxide and monoxide at equilibrium in the system $C + CO_2 \rightleftharpoons 2CO$, when determined by the decomposition of carbon monoxide, will vary with the nature of the deposited carbon, as it does when the equilibrium is approached from carbon and carbon dioxide.

International Commission on Illumination.—The reports of the papers read at the seventh session of the International Commission on Illumination, at Saranac Inn, N.Y., in September, 1928, have been published in book form by the Chemical Publishing Co., of Easton, Pa., at $5. The reports, running to some 1250 pages, are published in the various languages of the speakers concerned, while the discussions on the papers are also included. There is a comprehensive index for reference purposes.

North of England Gas Managers' Association (Auxiliary Section).—The Nineteenth Half-Yearly Meeting of the North of England Gas Managers' Association (Auxiliary Section) will be held at the Gas Office, Grainger Street, Newcastle-on-Tyne, on Saturday, Nov. 30, at 2.30 p.m., the Chair being taken by Mr. G. E. Anderson, B.Sc., of Howdon. Papers will be read by Mr. F. Nicholls, B.Sc., A.I.C., of Newcastle, on "Gas-Works and Benzole Recovery;" and Mr. W. E. Plevin, B.Sc., of Blackpool, on "Dirt in Coal: Its Influence on Carbonization." Tea will be served at the close of the meeting.

COAL CLEANING BY GRAVITY SEPARATION.

Visit to the Lessing Plant at the Ynisedwyn Colliery of Amalgamated Anthracite Collieries, Ltd.

In the "Journal" for Oct. 2 we gave an illustrated description of the Lessing coal-cleaning plant erected by the Clean Coal Company, Ltd., at the Ynisedwyn Colliery of Amalgamated Anthracite Collieries, Ltd. At the invitation of the Company, a party of gas engineers, coke oven managers, and others visited this plant.

Dr. R. Lessing took the opportunity of explaining to the visitors the principal features of the plant and process. Essentially, it is a two-stage system. The raw coal treated in the plant inspected consists of duff through $\frac{3}{16}$ in. to 0 in. screen, 85 p.ct. of which would pass through an $\frac{1}{8}$-in. screen. It is fed to an air separator, which removes the fine dust. So efficient is this operation that the amount of dust (below $\frac{1}{100}$ in.) left in the de-dusted coal is at a maximum 1 p.ct.; and the dust separated is sufficiently fine for direct utilization for direct coal-dust firing, without any grinding. The visitors expressed their appreciation of the efficiency attained, and were impressed by the cleanliness of the plant. There is, in fact, almost complete absence of coal dust, both in the building and outside. The cleanliness of the building can be judged by the fact that tea was prepared on the top floor for the visitors while the plant was in operation.

The gravity separation constitutes the second stage of the process. The de-dusted material is introduced into a separator containing a calcium chloride solution of the required specific gravity. Here, the previous removal of the fine dust greatly facilitates the separation of the clean coal from the refuse, and allows the clean coal to be washed free from calcium chloride without making more than 70 gallons of weak liquor per ton of coal treated. In the washing process, the removal of calcium chloride is so complete that the chloride content of the clean coal is in most cases less than that of the raw coal, some of the original salt being also removed in the process. A further advantage is that the coal is in such condition—because of the removal of fine dust—that the water drains away from it with amazing rapidity and with unusual completeness. In the case of small duff, the free water content is not more than 5 p.ct., while with the larger sizes it may be as low as 2 p.ct.

Another advantage which accrues from the efficient preliminary de-dusting of the coal is that the final drained product discharges from the drainer with great ease and at a controllable rate. It runs out, in fact, like dry sand, and its speed of discharge, which is easily controlled by a simple gate valve, is such that the wagons can be moved past the outlet as quickly as they can be trimmed. This, of course, is a great advance. Yet a further advantage is the absence of slurry.

The great economic advantage which impressed itself on the visitors is the exceedingly low ash content of the clean coal—practically the inherent ash of the coal—attained with little loss. Expressed in therms, the loss occasioned by the removal of the refuse averages 3 p.ct., and rarely exceeds 5 p.ct. even when high-ash slacks or duffs are treated. All present at the inspection commented on the efficiency of the engineering design and the general mechanical arrangements of the plant, which is the first commercial representative of its type.

AMERICAN GAS ASSOCIATION MEETING.

[From Our Special Correspondent.]

The Eleventh Annual Meeting of the American Gas Association was called to order by President Oscar H. Fogg at ten o'clock on Tuesday morning, Oct. 15, at Atlantic City, N.J. In a few words of welcome he spoke of the complete convention facilities afforded by the magnificent municipal auditorium, of the exhibits exceeding in number and diversity those of any previous years, and of the opportunity given for their inspection by appropriate programme arrangement. Then followed the reading of greetings from sister societies in Great Britain and on the Continent, and the election to Honorary Membership of the Presidents of these Associations.

The Treasurer's report, with its striking figures, continued the impression of size already made by a preliminary visit to the exhibits, and by the audience of over one thousand. Receipts from all sources were over $1,000,000. Assets in the general fund were $196,000. The laboratory spent $132,000 on appliance inspection and research work. The Industrial Gas Research Fund spent $85,000, and contracts had been entered into for the expenditure of most of the $161,000 still available. These sums seem very large compared with the $110,000 of total Association receipts in 1919, and yet they are such a small part of the $882,000,000 revenues of the gas industry in 1928, and such good results are accruing from Association activities and research, that future reports will deal with still larger items.

The Managing Director, Mr. Alexander Forward, presented the yearly review of the industry and of Association work. Activities are still guided by the five-year programme of 1926. Research in pipe joints, pipe coating, house cooling, mixed gases, large volume measurements, and production capacity of wells, is progressing satisfactorily, with the promise of valuable results. Three thousand persons have taken the course in domestic gas salesmanship. The appropriation for advertising gas for industrial purposes in trade magazines has been increased. Gas customers at the close of 1928 were 16 million, of which 500,000 were in Canada.

The President's address referred to the Exhibition "as one indication of the progress and virility of the gas industry. Only an industry pardonably proud of its achievements and optimistic of its future could produce such a remarkable display." He said that the Association's research work was "a carefully planned and systematically directed effort to secure improvement and economies in every department of our service." He spoke of the efforts to acquaint the public with all the advantages accruing from the use of gas.

Next came the election of a President, Vice-President, and Treasurer. Other officers were chosen later by the Company Members and the various sections, and the names are below:

General Officers.

President.—Mr. Bernard J. Mullaney.
Vice-President.—Mr. Clifford E. Paige.
Treasurer.—Mr. William J. Welsh.

Directors of Executive Board to serve two years.—Messrs. H. C. Abell, J. S. De Hart, Junr., F. C. Freeman, R. W. Gallagher, Arthur Hewitt, F. T. Hulswit, A. B. Macbeth, T. N. McCarter, Fred A. Miller.

Sectional Officers.

Accounting.

Chairman.—Mr. J. L. Conover.
Vice-Chairman.—Mr. J. I. Blanchfield.

Commercial.

Chairman.—Mr. Geo. E. Whitwell.
Vice-Chairman.—Mr. Merle E. Skinner.

Industrial Gas.

Chairman.—Mr. C. C. Krausse.
Vice-Chairman.—Mr. D. W. Chapman.

Manufacturers.

Chairman.—Mr. F. G. Curfman.
Vice-Chairman.—Mr. E. S. Dickey.

Publicity and Advertising.

Chairman.—Mr. James M. Bennett.
Vice-Chairman.—Mr. Donald M. Mackie.

Technical.

Chairman.—Mr. B. V. Pfeiffer.
Vice-Chairman.—Mr. R. G. Griswold.

Mr. R. B. Harper, as a member of its Managing Committee, described the work of the Association Laboratory. Each year more time was given to research work. The work on mixed gases was proving of great value, and investigation of propane and butane was under way. He said that a great majority of the appliances, as first presented for approval, failed to meet the required tests.

In the absence, from illness, of the Hon. James J. Davis, Secretary of Labour, Judge T. P. Risley described the "Essentials of Progress." He spoke of the effect of invention on human progress, of the 53 p.ct. increased efficiency of American labour in two years, of the need for a thorough study of the unemployment problem, of the safety movement, and of the necessity for all industry to serve humanity.

The second general session opened on Wednesday morning, with the report of the Accident Prevention Committee. This contained much information of value in creating safe working conditions. There has been a 34 p.ct. reduction in gas employee accidents since 1926.

The Committee on Education of Gas Company Employees submitted recommendations for an employee educational programme suitable to a small gas company, and a description of foremen training by the conference method. The report also described courses now being used by three companies for em-

ployee education. The income from $14,000 has been set aside for two college scholarships. All this shows the importance now being attached to the personnel of the industry.

The Rate Structure Committee made seven distinct recommendations to hasten the time when public opinion will be ready to accept without question an equitable basis for charging various classes of customers.

"The Gas Industry's Social Obligation and Economic Opportunity" was a fervent plea by Miss Laura Cauble, of the National Conference on Sanitation, that all gas men should work unitedly and untiringly to replace coal by gas, and so rid our cities of their smoke pall. This is a familiar theme to "JOURNAL" readers.

"Sales Methods under Strong Competition," by Mr. George E. Whitwell, was a forceful presentation. "The problem of selling becomes continually more essential. . . . Undoubtedly, we are in a selling era in our industry. The best gas service fails if the cooking range and water heater are . . . inefficient . . . if the house-heating equipment is poorly designed or . . . improperly installed."

At this point the regular order was interrupted for an overseas greeting, bearing witness to the wonders of modern invention, and the ties that bind alike the gas industries and the peoples of our two countries. I refer to the telephone greeting from Sir David Milne-Watson, amplified to over one thousand listeners. Prolonged applause followed his gracious and friendly message, briefly acknowledged by President Fogg. This spoken word of brotherhood following close upon the greatly appreciated visit of your Prime Minister, makes more kindly still our feelings toward our British kin.

The session closed with the "Economics of Load Building," by Samuel Insull, Jr. Load building requires sales promotion, and this in turn calls for the services of the rate expert, the sales manager, and the advertising man—not one should be left out.

On Wednesday evening, a large audience gathered to listen to a musical entertainment, followed by dancing. The occasion was taken to present, by the hand of the donor, McCarter medals to various persons who, during the past year, had restored to consciousness and life people overcome by gas. For more than thirty years our gas industry has been educating all its employees in proper methods of resuscitation, and hundreds of lives have been thereby saved. Mr. Charles A. Munroe also presented his substantial money award to Mr. Nils T. Sellman for his outstanding contribution to the gas industry, through the perfection of the gas refrigerator.

The last general session began promptly with "Where the Industry Stands in Research," by Mr. Walter C. Beckjord. "Necessarily, research work for the gas industry involves not only scientific investigation into the methods of production and distribution, but also developing new methods of utilization, and this leads to ramifications without end. A broad programme of research has been developed . . . in conjunction with appliance manufacturing companies, and this co-operation has been one of the outstanding developments of the past few years. The organization of the . . . Testing Laboratory . . . has been most important."

Mr. Henry C. Spurr, a writer on public utility matters, spoke of "The Gas Industry and the Public." He said the fact that there were 20,000 new uses of gas not known in 1915 proved the service given by the industry. He also stressed the importance of a proper rate structure to allow maximum service, and the need of public education on this subject.

The Committee on time and place of the next meeting recommended Atlantic City; and there were no dissenting votes.

The Committee on Resolutions congratulated Edison on his achievements, as celebrated in this Jubilee Year. The Association also went on record in favour of the conservation of natural gas.

Next came Dr. G. E. Vincent, President of the Rockefeller Foundation. On the programme his subject was "Getting and Applying the Facts." With his first words he captured his large audience, and he held their interested, and at times amused, attention, for he interspersed humour with seriousness throughout one of the most inspiring addresses ever delivered to a gas association. He spoke without notes, with all the skill of a trained lecturer, and his subject-matter was worthy of its delivery. When he stopped, the listeners rose with tumultuous applause. He said this was an era of co-operation between fundamental and applied research. As to fundamental research, the business interests of this country have almost completed a fund of $10,000,000, which will finance a five-year research programme having no direct practical bearing. So much for the conviction of American business that in the long run fundamental research adds to national wealth. As to applied research, we have to-day 1000 company industrial and commercial laboratories.

Following Dr. Vincent was Mr. A. W. Robertson, who had consented to make the closing remarks of the convention. His thoughtful observation on the great contrast presented by the scientific way in which business faced the future and utilized research, and the backward-looking attitude of law and civic life, with the suggestion that industries such as ours must find some way to aid in bringing research into political affairs, left a deep impression, and sent us home not only better gas men, but better citizens.

In addition to the morning session, as above described, with an attendance averaging nearly a thousand, there were held afternoon sessions for four days beginning on Monday with the Manufacturers' Section, and continuing with sectional meetings devoted to natural gas, accounting, commercial, industrial gas, publicity and advertising, and technical matters. There was also one session for women employees. In all, there were thirteen such sectional meetings, lasting thirty-three hours and holding the interested attention of hundreds in each gathering.

In the Technical Section on Wednesday afternoon there was much discussion of dehydration and its possible effect on an old distribution system. The experience in Great Britain, as related by Mr. Charles Cooper, was of great interest, and a vote of thanks expressed due appreciation. It so happens that in 1929 and 1930 the laying of several thousand miles of natural gas lines will result in the transfer from manufactured gas to natural gas of 500,000 meters. This will mean dry gas replacing saturated gas, and some past experience has shown that a degree of "re-hydration" will be required for a time, at least, to avoid distribution difficulties. Hence, "hydration" is of peculiar present interest.

Each year one is more impressed with the size of these gatherings. This time over 5500 came. Less and less discussion occurs at the sessions. Specific conferences on accounting, production, and distribution are held at other times during the year. The annual convention has become an occasion for viewing the materials and appliances of the industry on a vast scale —this year over 250 exhibitors and 70,000 sq. ft. of space. It also continues to afford an unequalled opportunity to see old friends and make new ones, and to exchange, in many conversations, knowledge for knowledge. Such contacts, extending over the years since the first gathering in 1871, have made for the solidarity and good fellowship we now possess. Hence, though we no longer meet as a few friends in a small room, and are perhaps awed by our great numbers, we realize how much strength there is in our united effort, and have full confidence in our leaders to make our future progress worthy of the past.

This account has already grown to undue length without any mention of the entertainment programme or the wonderful auditorium which housed the meeting. Three nights of dancing, luncheon and card party for the ladies, and golf for the men did not differ from earlier conventions. The auditorium, however, far surpasses in size and convenience any previous meeting place. The main hall, in which the exhibition was held will seat 41,000 people. The ballroom, where the general sessions convened, holds 5000. Numerous smaller rooms provided amply for sectional meetings. All the appointments of the building are complete, and Atlantic City is now without a peer for attracting national gatherings. To the already existing assets of wonderful sunshine, mild air, and seascape, and unrivalled hotels for individual comfort, it has added this perfect convention home.

SCOTTISH JUNIOR GAS ASSOCIATION.

(WESTERN DISTRICT.)

Visit to Glasgow Lighting Department.

On Saturday, Oct. 26, some 60 members of the Association visited the workshops and laboratories of the Glasgow Corporation Lighting Department, Trongate, Glasgow.

Mr. S. B. Langlands, Inspector of Lighting, welcomed the members and explained briefly the methods of this Department. The annual cost was approximately £300,000, and the staff numbered 1200. There were 600 miles of streets and 120,000 lamps. At one time his Department could take one-fourteenth of Glasgow's make. A demonstration was given by Mr. Imrie Smith, of the Electric Lighting Service Bureau.

The party then divided into small groups, and were conducted through the various sections of the Department, where the staff spared no effort to explain and demonstrate the work and testing.

After the inspection the members were entertained at tea.

Mr. RONALD KEILLOR, President of the Association, in thanking Mr. Langlands, expressed his admiration at all he had seen during the afternoon; there was thoroughness and efficiency in evidence everywhere, and the success of the working of the Department reflected very great credit on the Chief, Mr. Langlands.

Mr. LANGLANDS thanked the members for their attendance. He related how some 43 years ago he had been in charge of a small works, and humorously spoke of some of the difficulties he had to contend with then. Difficulties were the Juniors' ladder of success. He was proud of his Department, and attributed the successful working to loyal team work. He then called on Mr. J. McGhee, Mr. A. Smith, and Mr. J. Frazer, who, though perhaps "members of the old brigade," still took an active interest in the work of the Juniors.

GUIDE BRIDGE WORKS OF GENERAL GAS APPLIANCES, LTD.

Visited by the Manchester and District Junior Gas Association, Nov. 2.

PART OF THE ASSEMBLING SHOP.

A BAY IN THE FOUNDRY.

A party of over 90 members assembled in Manchester, and were conveyed to the above works, being welcomed by Mr. W. R. Francis and Mr. S. C. Whitfield, Joint Managing Directors, who together with several of their technical assistants conducted the party over their extensive works.

Great interest was shown by the visitors in the extensive and well-equipped foundry. The enamelling furnace and plant, sand blasting apparatus, &c., also came in for general approbation, as also the grinding shops, fitting and other departments. There is a well-equipped general stores for spares, the undercover loading corridor being of special interest. The general layout of the works is such as lends itself to the speedy production of appliances, while the comfort of the staff and workmen has not been overlooked. The growth of the firm, since the last visit in 1922, was commented upon, and also the various extensions that were in progress.

After the works had been inspected, tea was served at the invitation of the Directors.

Mr. R. B. GLOVER moved, and Mr. A. L. HOLTON seconded, a cordial vote of thanks to the Directors for their hospitality.

MIDLAND JUNIORS AT SALTLEY.

About fifty members of the Midland Junior Gas Association paid a visit to the Saltley Gas-Works of the Birmingham Corporation Gas Department on Saturday afternoon, Nov. 2.

The visitors were received at the works by the Engineer, Mr. T. H. Hack, who expressed regret that, owing to ill-health, Mr. John Foster, the Engineer-in-Chief—who had given the invitation to the Juniors—was unable to be present.

The carbonizing plant consists of an installation of 56 Woodall-Duckham continuous vertical retorts of a total capacity of 425 tons of coal daily, producing approximately 7 million c.ft. of gas of 475 B.Th.U. per c.ft. Heating is by ten independent step-grate producers, arranged in two equal batteries. Three Babcock & Wilcox water-tube boilers take the waste heat, producing, at full work, 24,000 lbs. of steam per hour.

At the conclusion of the inspection, members were entertained at tea by the Gas Committee, and the appreciation of the visitors was expressed by Mr. C. F. Tooby (Coventry).

The vote of thanks was seconded by Mr. W. McNaughton, Senior Vice-President; and Mr. Hack responded on behalf of the Committee.

NEEDLE REGULATOR FOR INCANDESCENT BURNERS.

Exterior Indication of Interior Position.

Shut. Regulated. Wide Open.

The needle of the usual regulator, having no exterior indication of its internal position, cannot in consequence be operated with certainty when adjusting for the correct amount of gas and light.

If a point is made on the circumference of the external regulator head to correspond with the internal needle, no trouble is experienced in at once adjusting. Most of the regulators made have a slot across the head of the regulator. This slot should not be in line with the point, but across the head, as shown in the accompanying illustrations.

The slot may or may not have been made wide enough purposely to use a penny, but it answers the purpose for regulating when the burner is lighted. Also, for maintenance of burners, the foregoing will help in a better setting of the regulator to the correct position.

The regulator, when the burner is screwed up, should come midway between two combustion outlets, and not over one combustion outlet. The illustrations speak for themselves.

SMOKE ABATEMENT EXHIBITION AT MANCHESTER.

At the 1924 Smoke Abatement Exhibition in the Manchester City Hall there was a good show of plant for the production of, and appliances for the consumption of, gas in the provision of heat, light, and power. Since then the Manchester public have had opportunities of seeing minor displays of such appliances in connection with other exhibitions of the "Brighter Homes" and "Health and Hygiene" type.

The Smoke Abatement Exhibition, which was opened on Nov. 5 in the Manchester City Hall, offers a much broader field, and it brings together gas and electricity, preserving a competitive attitude towards one another but united in the common purpose of proving superiority over the use of coal. The task of presenting the case for gas was undertaken by the Lancashire and Cheshire Gas Exhibit Committee, for which Mr. J. H. Sillitoe is acting as Hon. Secretary, and on which are represented 36 undertakings in Lancashire and Cheshire and a number of gas apparatus manufacturers.

The undertakings are: Altrincham, Ashton, Blackburn, Bolton, Burnley, Bury, Chester, Chorley, Colne, Farnworth, Frodsham, Haslingden, Heywood, Hyde, Kirkham, Leigh, Littleborough, Liverpool, Lymm, Manchester, Middleton, Northwich, Ormskirk, Oldham, Preston, Radcliffe, Rochdale, Runcorn, Salford, St. Helens, Stalybridge, Stockport, Stretford, Tyldesley, Wallasey, and Wigan. The firms include: Appleby & Co.; Anthracite Radiation, Ltd.; W. H. Dean & Sons, Burnley; Faulkner & Co., Hollinwood; Sidney Flavel & Co., Ltd., Leamington; General Gas Appliances, Ltd., Guide Bridge; Hygienic Stove Company, Huddersfield; Jackson Boilers, Ltd., Leeds; R. & A. Main & Co., Ltd., Falkirk and elsewhere; National Radiator Company, Hull; Parkinson Stove Company, Ltd., Stechford; J. Stott & Co., Ltd., Oldham; F. Turner (Art Metal), Ltd., Birmingham; as well as the six firms who combine in Radiation Ltd. (Arden Hill & Co., The Davis Gas Stove Company, Ltd., Fletcher Russell & Co., Richmond Gas Stove Company, Wilsons & Mathiesons, and J. Wright & Co.). The following other firms also co-operated: George Bray & Co., Ltd., Leeds; Brayshaw Furnaces & Tools, Ltd., Peter Higson & Co., Ltd., Horstmann Gear Company, Ltd., the Thermal Syndicate, Ltd., and the Wholesale Fittings Company, Ltd.

The principle of co-operation has been applied very effectively. Instead of each firm having a separate stand and displaying its own products exclusively, this part of the exhibition has been treated as a whole, and planned in sections. The aggregate area of show space occupied amounts to approximately 450 sq. yards.

GAS COOKERS.

In this section is displayed the very latest designs of gas cookers in enamelled finishes, with and without automatic heat regulators. All are specially designed for cleanliness and ease in cooking. To those with floor space to spare the eye-level cooker will make a strong appeal, as it eliminates stooping and lightens work considerably.

GAS FIRES AND RADIATORS.

The gas fire and radiator section displays the most modern types of gas fires in attractive mantels and decorative effects for use in the dining-room, bedroom, drawing-room, or kitchen. Various types of gas-heated radiators are shown for use in the hall, office, or workshop. Apart from other advantages, a great saving in floor space is made by the use of gas radiators.

CANTEEN AND RESTAURANT APPLIANCES.

A comprehensive display of large scale restaurant and canteen cooking apparatus is shown on this stand, including a gas-heated fish and chip range and other apparatus of interest to restaurant and café proprietors and school and public institution authorities.

DOMESTIC HOT WATER SECTION.

Displays in this section are the latest designs in hot water apparatus, including geysers, circulators, and various appliances conducive to bathroom comfort.

INDUSTRIAL HOT WATER SECTION.

Instantaneous water boilers, coffee-making machines, tea and coffee urns, and other fitments for works canteens and restaurants are shown in operation in this section.

FURNACE SECTION.

A special exhibit of gas-fired furnaces and industrial apparatus is shown, including various types of furnaces used for melting, hardening, tempering, rivet heating, annealing, &c.

COKE BOILER SECTION.

A display of domestic coke-heated boilers is made, drawing special attention to the advantage of gas coke as a domestic fuel.

BRITISH COMMERCIAL GAS ASSOCIATION.

The exhibit of the "B.C.G.A." demonstrates the right way to use coal by carbonization at the gas-works. The display portrays a "sunshine" city, such as any large town could be if the use of crude coal in the home and factory was abolished, thereby eliminating the soot and smoke, which means dirt,

darkness, and bad health to its inhabitants. In addition, samples of the valuable bye-products obtained from coal during the process of carbonization are shown.

MODEL KITCHEN.

A model gas kitchen is constructed to show, in a practical way, the part gas plays in the housewife's workshop—this being how the average housewife regards her kitchen. The most modern gas cooker is displayed complete with automatic heat regulator, which makes gas cooking so reliable. A small geyser for supplying hot water to the kitchen sink is displayed. The useful little gas iron is shown on the table ready for use.

At this stand is also exhibited a tableau for which the Committee which undertook the promotion of the exhibition are responsible. It typifies the slogan, "Gas Makes Work Your Pleasure." A lady, in wax, is shown doing cooking operations with a gas cooker.

COOKERY DEMONSTRATION STAND.

The services of Miss H. H. Tuxford, M.C.A., have been retained to demonstrate the advantages of gas cookery and the most efficient way of using the gas cooker. Miss Tuxford will show on four occasions during the period of the exhibition how a household dinner for six persons can be cooked for 1½d. worth of gas, as checked by a slot meter. Particulars of the various menus can be seen in the cookery programmes obtainable from the stand.

GAS LIGHTING SECTION.

The very latest designs in gas brackets and pendants, with a comprehensive selection of bowls and shades, are displayed in this section. A number of the lighting points are fitted with automatic switches demonstrating how gas lights can be turned on and off by a wall switch. The different gangways are illuminated by high-power low-pressure suspension lamps, one of which is controlled by switch gearing.

FUEL SECTION.

This section affords a concrete example of the advantages of using smokeless fuels—*i.e.*, gas or domestic coke—compared with the wasteful method of burning raw coal in the open grate.

TABLEAUX.

The British Commercial Gas Association has provided an exhibit which includes a model gasholder built up on a stack of raw coal. From the gasholder tapes run out to the four corners of the stand to samples of bye-products obtained in the manufacture of gas.

A second tableau of striking interest is that of the Lancashire and Cheshire Gas Exhibit Committee, typifying "The Spirit of Coal." At the four corners of the stand are gas-heated appliances—an engine, a cooker, a fire, and a furnace. The engine typifies power, the cooker domestic purposes, the fire warmth, and the furnace industrial operations.

STAND LIGHTING.

Special attention has been paid to the lighting of the stands in order to show the public what can be done by gas in this direction. Messrs. William Sugg & Co., Ltd., have supplied all the exterior lighting points, and they have provided a large number of lamps, mostly of the "Littleton" and "Bon Marché" types.

At the "B.C.G.A." stand flood lighting effects are secured with Sugg's "Directive" lamps.

Messrs. George Bray & Co., Ltd., of Leeds, have supplied various domestic burners and fittings, and the Wholesale Fittings Company, Ltd., have also supplied similar fittings, each firm having its own particular styles.

OTHER EXHIBITS.

A very interesting exhibit was one showing the large accumulation of carbon deposit in a chimney attached to an ordinary coal fire, as contrasted with the perfectly clean state of two other chimneys in connection with which Messrs. Sidney Flavel & Co. had in one case installed a "Metro" log gas fire, and, in another case, a "Metro" coke fire.

The Fuel Department of the Manchester College of Technology, under the superintendence of Mr. A. McCulloch, M.Sc.Tech., F.I.C., demonstrated the present position with regard to the provision of solid smokeless fuel particularly suitable for use in domestic grates. A contrast was drawn between the products of the high and low-temperature carbonization of coal, specimens of the products being shown. The exhibit also illustrated some of the activities of the Fuel Department of the Manchester College of Technology.

Amalgamated Anthracite Collieries, Ltd., showed examples of anthracite in all sizes suitable for steam raising, gas plants purposes, central heating, horticultural, and domestic purposes.

Messrs. Edward Bennis & Co., Ltd., exhibited working models of a "Bennis" smokeless sprinkler stoker and a "Bennis" smokeless coking stoker.

The Crosthwaite Engineering and Furnace Company, Ltd., showed their patent mechanical stoker and self-cleaning furnace.

Messrs. Duguids', Ltd., brought to the notice of fuel consumers a number of simple and inexpensive instruments which helped the "human" element to build up and maintain the efficiency of boilers, furnaces, &c., thus eliminating black smoke and saving expense.

Messrs. Hartley & Sugden showed the Wollaston patent producer furnace and Wagnall boiler system.

The Heywood Air-Tight Damper Company, Ltd., exhibited patent air-tight dampers and damper cases to suit existing dampers, patent expansion joints for front end and back end of Lancashire boilers, and a patent baffle furnace.

Messrs. James Hodgkinson (Salford), Ltd., showed their patent automatic, smokeless and gritless coking stoker, with self-cleaning firegrate for use without steam jets, together with other apparatus.

The Illingworth Carbonization Company, Ltd., are dealing with the problem of low-temperature carbonization, and exhibited a scale model of their carbonizing plant. Demonstrations are given of the use of "Ricoal" in (*a*) the ordinary domestic grate; and (*b*) anthracite, or slow combustion stove, besides showing samples of "Ricoal" made from different coals.

Low-Temperature Carbonisation, Ltd., exhibited samples of "Coalite."

Messrs. Meldrums, Ltd., displayed models of types of their mechanical stokers and other apparatus.

The National Gas Engine Company, Ltd., exhibited their "R" type horizontal gas engine, developing 26 maximum brake horse-power on town gas at a speed of 260 revolutions per minute. The engine can be started up at a moment's notice and will run for long periods without attention beyond occasional supervision of lubricating arrangements in the way of the replenishing of oil cups, &c.

The stand of the National Smoke Abatement Society showed a number of models, photographs, and other exhibits relating to the smoke nuisance, together with a wide range of literature upon the subject.

Messrs. James Proctor, Ltd., exhibited their patent shovel stoker and self-cleaning fire bars and their patent ram feed coal elevator.

The Smokeless Combustion Company, Ltd., showed their hydra-oxygen smoke burner, a simple and inexpensive apparatus which can be fitted to any type of Lancashire, Cornish, economic, or marine type of boiler, and which can effectively eliminate smoke.

The Triumph Stoker, Ltd., exhibited their "Triumph" stoker with self-cleaning forced draught furnace.

The Turbine Furnace Company, Ltd., exhibited their turbine furnace.

THE OPENING CEREMONY.

A large number of visitors were present at the opening ceremony of the Exhibition. Sir WILLIAM MILLIGAN, M.D., LL.D., J.P., presided.

Sir WILLIAM MILLIGAN, in calling upon Mr. Arthur Greenwood formally to declare the Exhibition open, said that, roughly speaking, three-quarters of the total atmospheric pollution was due to domestic smoke, and one-quarter to factory smoke. Though Parliament, by its Bill of 1875, had done much to mitigate the nuisance of factory smoke, much remained to be done both by the civic authorities and by the people of this country generally.

Mr. ARTHUR GREENWOOD, M.P., Minister of Health, in declaring the exhibition open, said he sometimes wondered what kind of observation a visitor from a saner world than this would make if he came to this earth and saw all our Manchesters, Sheffields, Birminghams, &c., drenching themselves in an atmosphere of filth day after day. He would see great cities spending large sums of money providing themselves with pure unpolluted supplies of water, and yet allowing themselves to live in a polluted atmosphere of air. He would see thrifty housewives stirring up the kitchen fires, and then spending laborious days cleaning away the dirt which accumulated therefrom. He would also see great numbers of people daily fleeing away to the country and the seaside in order to escape from the enemy they had themselves raised in their midst. It was obviously not right that they should wash the outsides of their bodies with clean water, and then take into their lungs the filthy air which surrounded them. Where there was smoke there was waste, and the one thing which above all else was needed to restore economic prosperity to the country was economic efficiency. Fresh air and glorious sunshine were the finest physicians mankind could have, and the smoke nuisance was a grave national menace which should be eliminated from the lives of all people. In industry bad firing, inefficient stoking, and inadequate out-of-date plant were responsible for a great deal of the smoke which hung over their towns, while the domestic user of coal was also a sinner, because 40 million tons of raw coal were annually burnt inefficiently in the homes of the people. Science had not yet completely solved the smoke problem, but much research work had been done in that direction; and this research work must continue. Personally, he did not believe that there was any one avenue to the solution of this great problem; the evil was so widespread that it had to be attacked upon a very wide front. Parliament had done

its duty, but they had not yet got effective local administration in regard to smoke abatement, and this local administration must be of the regional type, and not merely the independent action of single authorities. There must be co-operation between all the interests concerned; and, in the last resort, the problem was one which called for the co-operation of the rank and file of the people.

The LORD MAYOR OF MANCHESTER (Councillor Westcott, J.P.) moved that a hearty vote of thanks be accorded to Mr. Arthur Greenwood for opening the exhibition, and, in doing so, he made a special appeal to the tenants of offices in the City of Manchester to instal gas or electric fires in their business premises.

The LORD BISHOP OF MANCHESTER seconded the vote of thanks, which was supported by Dr. VEITCH CLARK, the Medical Officer of Health for the City of Manchester.

Dr. H. A. DES VOEUX, President of the National Smoke Abatement Society, proposed, and Alderman W. T. JACKSON, Chairman of the Manchester Corporation Health Committee, seconded, and Alderman WILL MELLAND, J.P., Chairman of the National Smoke Abatement Society, supported, a vote of thanks to Sir William Milligan for presiding.

RADIANT GAS HEATING FOR HEALTH.

Beneficial Effects of the New "Beam" Radiant.

On Friday last, at the Research Laboratories of Radiation Ltd., Grosvenor Place, London, there was carried out a scientific demonstration designed to dispose of the old idea that a gas fire merely warms or scorches the outer skin while leaving other parts of the body not directly exposed to the heat rays quite cold.

It was attended by representatives of the medical profession and of scientific bodies, to whom it was explained that in consequence of the development of the "Beam" radiant, which is by now well known to our readers, the quality of the heat given off has an increased proportion of the short infra-red rays. Short infra-red rays have a much more penetrating effect than the longer heat rays, and pass more readily through the skin, so heating the blood stream and avoiding the scorching sensation which is otherwise produced.

It is known that some 60 p.ct. of the energy in sunlight is in the form of visible and short infra-red rays, and the pioneer researches of Sonne, of the Finsen Institute of Copenhagen, indicate that the remarkable curative value and beneficial effects of sunshine are largely due to the penetrative action of its energy. Therefore, as the radiation from the domestic gas fire is modified so as to contain a greater proportion of visible and short infra-red rays, its hygienic quality is improved.

The skin-penetrating property of the rays from the new gas fire was demonstrated by experiments with the arm of a member of the Radiation Research Staff. A fine hypodermic needle had been converted into a thermo-couple. The needle was inserted lengthwise under the skin until the point was in the neighbourhood of the blood capillaries underneath. The fine wires of the thermo-couple led to a second similar junction immersed in water, in a thermos flask, at the normal blood temperature of 98·4° Fahr. Included in the circuit was a delicate galvanometer, which recorded the slightest rise in temperature of the point of the needle buried in the arm.

When the arm was exposed to the heat from the gas fire, the galvanometer recorded a steady rise in temperature as the heat penetrated the skin and warmed the needle. It was shown that subcutaneous temperatures considerably higher than the normal blood heat could be reached without the sensation of excessive scorching of the surface of the skin.

Other experiments of an interesting character were described to show the greater degree of comfort attainable with the new Radiation gas fires, and the attention of the visitors was drawn to the many new designs which will be marketed this winter.

Dr. HAROLD HARTLEY, Chief Chemist to Radiation Ltd., gave a short account of the research undertaken for many years past by the firm—experiments which have culminated in the "Beam" radiant. Following this, Prof. LEONARD HILL, F.R.S., said that his own work in the same direction, carried out quite independently, provided direct confirmation of the results which had been obtained by Radiation Ltd. Messrs. Radiation had found, and he too had found, that the shorter infra-red rays penetrated the horny layer of the epidermis to the living cells, and provoked transpiration of water. This gave a pleasant feeling—a much more comfortable sensation than that produced when the body was exposed to dark, dull heat such as that from hot-water radiators or electric fires. In his own house he had two gas fires, one of the old type and one fitted with "Beam" radiants, and he found that the effect of the new radiant was to eliminate any dry, uncomfortable feeling which one sometimes experienced with the radiants of the old pattern. This was entirely due to the quality of the energy emitted from the fire fitted with "Beam" radiants.

Continuing, Prof. Leonard Hill remarked that the sun emitted practically no infra-red rays of a wave-length corresponding to the dark heat given off by steam radiators, and appliances of that type. Hence the heat emitted from such appliances was not natural. The aim should obviously be to approach Nature as nearly as possible; and this was accomplished by the new "Beam" radiant. Experiments had shown that the energy emitted by the "Beam" increased the resistance of the body to the streptococcus germ. The reason was still being investigated.

Institute of Physics.—A public lecture under the auspices of the Institute will be held at the Institution of Electrical Engineers, Savoy Place, Victoria Embankment, W.C. 2, on Nov. 27, at 5.30 p.m., when Dr. C. H. Lander will deal with the subject of "Physics in Relation to the Utilization of Fuel."

Institution of Chemical Engineers' Examination, 1930.—Application forms (returnable Dec. 23) and particulars of the Associate-Membership Examination for 1930, together with the Memorandum on "The Training of a Chemical Engineer," may be obtained from the Hon. Registrar, Institution of Chemical Engineers, Abbey House, Westminster, S.W. 1.

Southern Association of Gas Engineers and Managers.—As we have already announced, Mr. F. J. Pearce will read a paper on the complete gasification plant at Mill Hill, at the general meeting of the Southern Association of Gas Engineers and Managers on Nov. 22. Mr. L. Trewby, Engineer and General Manager of the North Middlesex Gas Company, has intimated that the plant described in the paper may be inspected by members of the Association at the Mill Hill Works of the Company on either Thursday, Nov. 21, Friday (morning), Nov. 22, or Saturday (morning), Nov. 23. Members wishing to take advantage of this permission are requested to notify Mr. Trewby, North Middlesex Gas Company, the Broadway, Church End, Finchley, N. 3 as soon as possible, stating the day and time selected for their visit, in order that the necessary arrangements may be made.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

Gas Poisoning Committee.

SIR,—In connection with my evidence before the above Committee, the condensed report which you have given makes it difficult to follow some of the figures.

With regard to the figures of coal and coke published on p. 398 ("JOURNAL" for Nov. 6), these statistics relate only to the difference between the percentage of water gas in 1928 and 1898. If water gas were completely abolished, the additional coal required would be 4,370,000 tons, and the additional coke put on to the market 3,325,000 tons, making an additional amount of solid fuel handled of 7,695,000 tons.

I further went on to add that, if the water gas plants in Great Britain, complete with the accessory plant, were scrapped, it would mean destruction of capital value of approximately £4,500,000, and that coal gas plant built at to-day's prices to replace the manufacturing capacity would probably cost about £13,500,000, exclusive of storage.

GEO. EVETTS.

159, *Palace Chambers,*
Bridge Street,
Westminster, S.W. 1.
Nov. 8, 1928.

PARLIAMENTARY INTELLIGENCE.

[From Our Special Correspondents.]

HOUSE OF LORDS.

SPECIAL ORDERS.

A Special Order proposed by the Halstead Gas Company, Ltd., has been laid before the House, and referred to the Special Orders Committee.

The Horsham and Bury St. Edmunds Gas Orders have been passed by the Special Orders Committee, and are awaiting the affirmative resolution.

HOUSE OF COMMONS.

SPECIAL ORDERS.

A Special Order proposed by the Halstead Gas Company, Ltd., has been presented to the House.

Plans have been deposited under section 10 of the Gas Regulation Act of 1920 in respect of the Birkenhead Corporation Gas Order.

Use of British Tar for Roads.

Lieut.-Col. Sir FREDERICK HALL, M.P. for Dulwich, is asking the Minister of Transport to-day what were the respective amounts of imported American bitumen and of British tar used on the repair of roads in this country in the years 1924 to 1928, towards the upkeep of which grants are made from the Road Fund; and if he will make it a condition of such grants that a suitable proportion of British materials shall be used. In this connection it is understood that Mr. Hayday, M.P., and Mr. Will Thorne, M.P., are urging the Ministry of Transport to hold a series of tests by independent experts with a view to determining the respective merits of British tar and foreign bitumen for road-making purposes.

LEGAL INTELLIGENCE.

WATERLESS GASHOLDER PATENTS CASE.

An Extension Refused.

During last week the hearing was resumed and concluded, in the Chancery Division of the High Court of Justice, before Mr. Justice LUXMORE, of the petition by John Le Boutillier, Ltd., of 13, Rood Lane, E.C., and the Waterless Gasholder Company, Ltd., of the same address, for an extension of patents relating to waterless gasholders. The earlier portion of the proceedings was reported on p. 396 of last week's issue of the "JOURNAL."

The Hon. R. STAFFORD CRIPPS, K.C., and the Hon. H. FLETCHER MOULTON appeared for the petitioners; while the opponents were represented by Sir DUNCAN KERLY, K.C., and Mr. ROBERT BURRELL.

Sir DUNCAN KERLY submitted that the petitioners had not established their assertions that they had an invention of such great commercial and public interest that the Court should act in their favour and prolong the time for its exploitation. That, he contended, would not do unless the petitioners established that, by reason of circumstances that were exceptional, they had never had the opportunity of reaping adequate reward having regard to the nature of the invention. He further argued that the petition was devoid of material upon which the Court could act.

Mr. *R. J. Milbourne* (a Director of Dry Gasholders, Ltd.), for the opponents, dealt with the merits of the applicants' patents. He said his Company were working the Klönne inventions.

Mr. *Samuel Cutler* (Chairman and Managing Director of Samuel Cutler & Sons, Ltd.) expressed the view that there was no economy in the cost of the petitioners' waterless gasholders as compared with the spiral holder. He explained that, for a half-million c.ft. spiral holder at Spalding his tender was between £11,000 and £12,000; while for a waterless holder of the "M.A.N." type the cost would be about £3000 more. In another instance, for a million-and-a-half c.ft. holder of the "M.A.N." type, the net cost would have been £26,600, or, with royalties, about £28,000; while a spiral holder of the same dimensions would have cost about £24,000. At Plymouth there was a tender for a waterless "M.A.N." holder of 2 million c.ft. capacity at £37,270, as against £32,985 for a spiral type. Comparative prices for a 3 million c.ft. waterless "M.A.N." type holder were £42,000, including royalties, as against £38,500 for a spiral type holder. It was true that the costs for the foundations of a waterless holder were less than those for a spiral; but what was saved on the foundations had to be expended on the construction of the waterless holder. His firm had spent a lot of money on plant for the manufacture of the tankless gasholder.

Mr. CRIPPS, in the course of his reply on behalf of the petitioners, characterized the invention as so revolutionary that it deserved to be assisted in every way.

JUDGMENT.

His LORDSHIP, giving judgment dismissing the petition, said that both the master patent and the additional patents were, before the war, owned by the "M.A.N." concern; and the war prevented their exploitation. Little was done until 1921, when Messrs. Cutler wrote to the "M.A.N." making inquiries about the patents. Nothing came of it; but in April, 1923, Messrs. Cutler again opened negotiations, and a draft agreement was drawn up. After that a provisional agreement was made with the "M.A.N.," and Tankless Gasholders, Ltd., was formed. Further discussion followed, in consequence of the patents being enemy-owned; and ultimately the "M.A.N." agreed to sell the patents to John Le Boutillier, Ltd. Following this there were negotiations so that the Tankless Company should have a license to work the invention; but that matter came to an end on the discussion of royalties, which the "M.A.N." would not reduce.

John Le Boutillier, Ltd., purchased the patents for £800, with the consent of the Comptroller of Patents; and in 1927 formed the Waterless Gasholder Company, Ltd., to exploit the patents. Since then five waterless gasholders had been erected in this country under the patents, and orders for a further eight had been received.

The present application was for an extension of the time for exploiting the patents for another ten years; and the petitioners had to satisfy the Court that the patents were such as to justify such an extension having relation to the public interest and requirements. It did not follow that they must show that the invention had a meritorious amount of ingenuity, but that it was one of practical utility—in other words, that it was a useful invention. Evidence of novelty or ingenuity was not to be ignored, of course.

He was satisfied on the evidence before him that the petitioners had shown a degree of novelty and public utility to warrant consideration of the question of the extension of the patent. Indeed, he thought the novelty and public utility were really accepted by Mr. Cutler, who gave his evidence with considerable candour and great fairness. His Lordship was satisfied with the novelty and public utility of patents No. 16,184 of 1914 and No. 155,298 of 1917. The other patents only dealt with trivial matters.

Having decided this, it became necessary to consider the question of the patentees' remuneration; and in this connection it was necessary to bear in mind that the petitioners were the assignees of the patents, and were sub-licensees. The assignee was always treated as being of less merit than the original inventor. What was the position here? The petitioners bought these patents towards the end of their existence for the sum of £800. They spent considerable money in exploiting them, and had not, in fact, made any profit on their purchase. But it was not sufficient to consider the profit made by the assignee; one must consider the profits made by the patentee as such. This included the profits made by the original patentee and all subsequent holders. In the present case, the original holder was the "M.A.N." The "M.A.N.," in fact, made no profit out of the patents beyond the share of the purchase consideration and the share of the royalties paid on gasholders erected under the licence. There was no evidence before him as to the amount of these profits; and this might well be a serious objection to the petition. But he was unwilling to deal with the petition on this ground; for there was a far more formidable objection. The Act provided that the Court were to take into consideration all the circumstances of the case. The decisions under this section showed that this included profits made out of the foreign patents (if any) covering the same invention. The "M.A.N." undoubtedly had foreign patents covering the inventions in question; and they made, or at least might have made, considerable profits out of these patents. Yet the Court were given no information with regard to them.

In the circumstances, concluded his Lordship, he was quite unable to answer the question whether the patentee—and this included, of course, all those persons who had held the patents in question, including the original patentee—had been adequately remunerated or not. The onus of proving that there had been inadequate remuneration was on the petitioners, and as it had not been discharged by them, the petitions must necessarily fail. There was a further ground which he ought to mention. It was incumbent on a petitioner to show that every possible step had been taken to launch the invention in respect of which the power of the Court was invoked; and he was unable to come to the conclusion that the "M.A.N." showed such diligence as would, provided all other considerations were decided in their favour, entitle them to any extension. Both petitions must be dismissed, with costs.

Fire at Crowle Works.—An outbreak of fire occurred recently at the Crowle Gas-Works, near Doncaster. The engine house was burnt down, and as the holders were in close proximity, gas contained in them was allowed to escape, in order to avoid the possibility of an explosion. Householders in the vicinity were warned to leave their homes until the danger of an explosion had been averted. The Manager succeeded in providing a limited supply of gas for the night, but the street lamps were not lighted until a few nights later.

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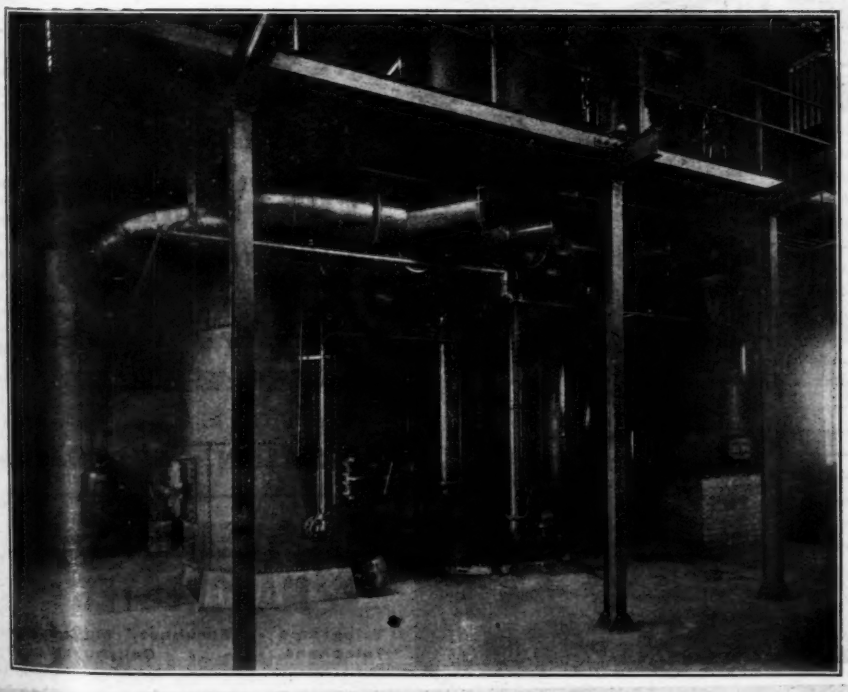

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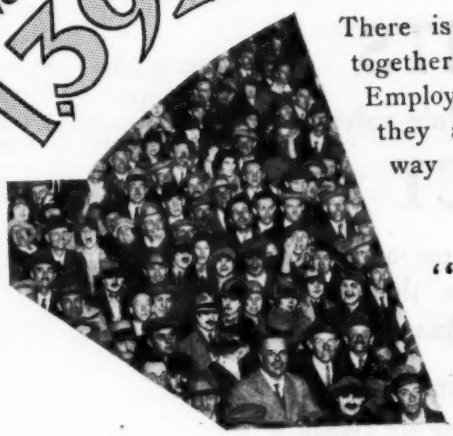

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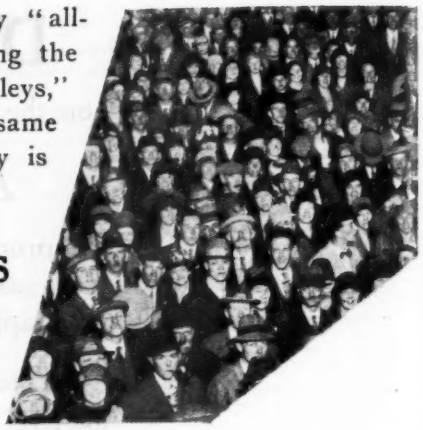

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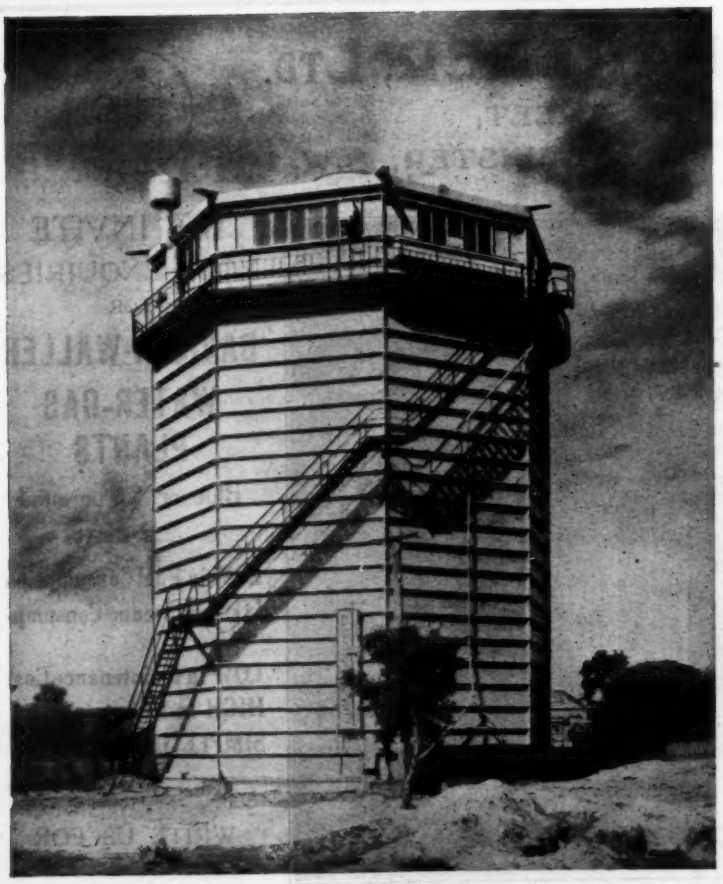

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MISCELLANEOUS NEWS.

GAS COMPANIES' PROTECTION ASSOCIATION.

A Year's Record of Unusually Important Unified Effort.

Mr. R. W. EDWARDS, the Chairman of the Gas Companies' Protection Association, presided at the thirty-second annual general meeting in the Caxton Hall, Westminster, on Thursday last, when he gave a review of the year's work, and emphasized the necessity for the extension of the activities of the organization.

FINANCIAL POSITION OF THE ASSOCIATION.

The CHAIRMAN, in moving the adoption of the annual report and balance-sheet, said: Dr. Carpenter had quite hoped to be present at the meeting, but was, at the last minute, unavoidably prevented by another business engagement. The Association has completed another satisfactory financial year. The revenue account shows a surplus of £132. The assets now amount to £2516, including £2200 of war loan at cost, which at present values shows a substantial appreciation. The bank balance is £371, of which £250 has since the date of the report been placed on deposit with the Association's bankers. Only £8 8s. remains outstanding in respect of subscriptions for the year under review, and £1 1s. for the previous year.

PRESENT POSITION OF THE GAS INDUSTRY.

The Association watches the gas industry as a whole, and I feel strongly that we are about to enter into a period of peculiar competition, and that the activities and developments of the industry in the immediate future are of vital importance. Hitherto it has been fairly certain that, for the purposes of heating and cooking, gas had mainly to combat solid fuel, and this rival it has for a long period been steadily outpacing. With the imminence of the operation of the electricity grid system of supply, large and less expensive sources of electric current may be anticipated. The gas industry will face this growing competition with every confidence in maintaining what we may now claim to be almost a monopoly of up-to-date kitchens, but new paths and means of co-operation will have to be opened up and exploited.

AREA GAS SUPPLY.

So much for competition in the gas industry. But the coke markets also are being filled to an increasing extent by the products of the coke oven industry; and it must follow that, as the output of oven coke increases, the output of surplus oven gas will increase more than proportionately, and that difficult questions may be expected in this connection. Happily, co-operative movements in regard to marketing of coke and residuals promise to relieve these difficulties to some extent, and satisfactory arrangements in many cases have been made between members of the gas and coke ovens or colliery industries. It cannot be denied that only the fringe of the problem has yet been satisfactorily dealt with in these ways, but only two days ago I noticed in the Press a reference to a most interesting achievement in Scotland. It is stated that a scheme has now been completed whereby the Glasgow Corporation is to receive a bulk supply of 20 million c.ft. of gas per day, for fifteen years, from a group of Scottish Collieries, the gas being produced at the pit-head and transmitted to Glasgow by long-distance mains.

This is an important illustration of what is being done by way of working agreement between gas undertakings and the coal and coke oven industries; and, coming from where it does, we may be sure that the financial aspects of the scheme had not been overlooked or found wanting.

In connection with this subject, Mr. H. E. Bloor, as you are no doubt aware, has recently given evidence on behalf of this Association before the Board of Trade Committee set up to inquire into the case for an area gas supply. Mr. Bloor has devoted a great deal of time and trouble to this matter, and his evidence courageously presented many aspects of the question in a concise and lucid manner, and was, I understand, extremely well received by the Committee. It will be appreciated that this Association is particularly interested in this problem, in view of the fact that the proposals submitted are likely to be of far more significance to company undertakings than to those of local authorities. I strongly support the case put forward by Mr. Bloor, and would particularly associate myself with his arguments in favour of the relaxation of the hampering statutory restrictions. I have pleasure in suggesting that this Association expresses to Mr. Bloor its appreciation and thanks for the work which he has expended in preparing and giving evidence on its behalf.

COAL GAS POISONING COMMITTEE.

Referring to other activities of the Association during the current year, the Board of Trade has also set up a Committee to inquire into the question of deaths from coal gas poisoning. A large number of witnesses have been examined, and the proceedings have been closely watched from day to day on behalf of the Association. On Oct. 10 Mr. F. W. Godenough gave evidence on behalf of the gas industry generally. Mr. Goodenough dealt most thoroughly with many aspects of the question from the point of view of gas undertakers, and gave the Committee a great deal of useful information. The thanks of the Association were expressed personally to Mr. Goodenough, and I am certain that members will feel extremely grateful for his activities.

The question was left in the hands of Mr. Anderson, Mr. Stokes, and myself, and, thanks to the consent of the National Gas Council, we were permitted to see the "proof" of Mr. Goodenough's evidence. We came to the conclusion that it was so good that it could not be better. Mr. Goodenough spoke on behalf of the National Gas Council and the Gas Companies' Protection Association, which represented the whole of the gas industry. To the suggestion that Mr. Goodenough should officially speak on our own part, he very readily agreed.

THE MAYBURY CLAUSE.

The clause originated by Sir Henry Maybury for the purpose of standardizing and protecting the interests of public utility companies in questions of reinstatement of highways had been fully considered and discussed by your Committee, and by the conjoint conference of public utility associations. It is felt that the inability of the latter to come to an agreement as to its general approval is to be regretted, but that the matter should not be lost sight of by the gas industry, which, as such, has approved the clause. The only partner of the joint conference which disagreed was "the water people;" gas and electricity were agreed—and we remain so—to watch the circumstances which might arise, in the hope that probably we shall be able to come to some understanding, if not on behalf of all bodies which are interested, at any rate on behalf of gas and electricity.

PROTECTIVE CLAUSES.

Referring to another aspect of the serious problems arising from modern practice in highway construction, the protective clause inserted in the Royal Victoria and Other Dock Approaches (Improvement) Bill of 1929 is worthy of close attention. It is certain that in most parts of the country highway problems are rapidly increasing, and it is thought in many cases that this clause might well be adopted for Private Bills and Orders.

The clause which appears in the Act as section 32 widely defines the words "apparatus and undertaker," the former including, *inter alia*, mains, pipes, tubes, or apparatus for supplying gas, standards and brackets carrying street lamps, and other structures and works, while the latter includes the "owners of apparatus as so defined." It then provides that the appropriate authority shall have power which, if reasonably so required by the undertaker, they must exercise to remove, divert, or alter the position of apparatus in the scheduled area, constructing any necessary works, to replace those removed, to the satisfaction of the undertakers, and paying compensation for any damage. The appropriate authority must give the undertakers seven days' notice of their intention, and the undertakers may themselves carry out the work specified by the appropriate authority at the latter's expense. I think that I need not emphasize this point at all—it is very clear.

It is also provided that the undertakers shall be paid compensation for any apparatus rendered derelict or unnecessary unless substituted apparatus is provided. The amount of compensation, if not agreed, is to be referred to arbitration. The works authorized by this Act are of considerable magnitude and importance, and it is clear that the protective provisions will form a useful precedent for the purposes of subsequent cases where protection will be needed.

MONOPOLY OF FOOTPATHS.

As a direct result of the difficulties caused by modern highway construction—particularly ferro-concrete—utility companies, like the much harassed pedestrian, are being driven to rely upon the comparative security of the footpath, and here they are met with the further difficulty of an encounter with an authority which had already established itself in this haven.

The Postmaster-General has in some cases fully occupied all the available space, and with the object of asserting the rights of the undertakers, at the request of a conjoint conference, the Association has obtained from its members a considerable amount of information with regard to their individual experiences. In connection with this subject of ferro-concrete roads, it may be remembered that this Association made representations in the summer of last year, to the Ministry of Health and the Ministry of Transport, that loans and contributions towards the cost of re-making existing roads in ferro-concrete should provide for, or be conditional upon, compensation being paid to gas companies for the cost of removing or replacing their mains and services. Both Ministries stated their inability to act on these representations owing, in the case of the Ministry of Health, to lack of authority; while, on behalf of the Ministry of Transport, it was stated in their reply, dated Aug. 8, 1928, that the "experience of this Department lends no support to the suggestions that special conditions should be attached to grants made from the road fund towards the cost of this class of work." This reply was in direct opposition to a speech made in the preceding June by Sir Henry Maybury, then Director-General of Roads in the Ministry of Transport. Sir Henry advocated that in country areas capacious margins, and in urban districts subway accommodation under footways, should be provided, and all mains and cables laid therein. He then proceeded: "Do not let us regard the provision

of such subways or conduits as being impracticable, but let us have imagination, and make a commencement somewhere. . . . The Minister of Transport will, I am sure, be sympathetic to any such scheme, and will do his best to give financial assistance in the encouragement of what must eventually make for sound and far-sighted policy."

Meanwhile ferro-concrete development still goes on, and costs of main-laying, maintenance, and services continue to rise accordingly. The matter is obviously one for which provision will have to be made eventually, and the longer this is delayed the greater the difficulty and the cost of rectification will become.

I feel convinced that the matter is one of real and growing importance, and that the public do not realize the fact that the highways are used by and for them for purposes other than transport, and should therefore not be built solely for the advantage of the latter. But, though they may not realize this point, there is grave danger that it may sooner or later be brought home to them in an unpleasantly practical way in the increased cost of gas and of other public services.

RATING VALUATION.

Turning to a time-worn source of grievance, the Association is participating, through the representation of the Chairman, in the special conference convened to consider the question of rating valuation of public utility undertakings in England and Wales. I feel that if an advocate of the renovating and overhauling of rating valuation machinery does eventually achieve the benefits which have for so many years been called for and withheld, it will only be "because of his importunity." The sight of the recent generous concessions to so many of the staple industries of the country stimulates the desire for reform, and throws into higher relief the anomalies and hardships of the present system, though perhaps indirectly precluding the possibility of any lightening of the load now borne by the gas industry. However, it is impartial assessment and fair apportionment in rating matters that is asked for more urgently than any relief from the actual burden imposed, and I feel that dogged and persistent efforts may yet achieve these objects.

THE DEVELOPMENT (LOAN GUARANTEE AND GRANTS) ACT, 1929.

Turning, however, to a field in which statutory benefits are, in fact, available, the incentives offered by the late Government in the Development Act of 1929, to accelerate general development work of the kind likely to relieve the country's unemployment difficulties, had not perhaps been sufficiently tempting to cause the response which might have been expected. It is clear that it would be unwise for a company having no real scope for profitable expenditure, either now or in the fairly near future, to undertake development work simply to qualify for assistance under the Act. The provisions are so drawn, however, as to offer real inducement to companies who have opportunities to incur capital expenditure which, though promising to be of great value in some years' time, could not be expected to produce sufficient return in the immediate future to justify the interest charges accruing during the non-productive period. It is to companies having scope for such work that the offer is made; and it is on them, to some extent, that a responsibility and a duty are imposed to assist to the best of their ability in preventing and relieving the poverty and degradation resulting from the unemployment which this country appears unable to shake off. The Association has circularized its members recommending that such companies should make application for grants or guarantees, but I am unofficially informed that as yet the response from the gas industry has been most disappointing. I myself feel that members should be urged to look into the possibilities opened up by this particular statute, and to consider it in the light of conditions obtaining in their respective undertakings.

Looked at from the lowest point of view, the gas undertakings are contributing through taxation to the cost of the grants, and should not lightly reject the terms offered, while from a higher and more human angle they have the opportunity to relieve real distress at no cost to themselves, and with every prospect of considerable ultimate advantage.

GAS UNDERTAKINGS ACT, 1929.

The gas industry frequently finds reason to chafe under the more or less obsolete and worn-out legislative harness in which it now labours, and a real and pressing need is felt for newer and more up-to-date statutory provisions. These must allow the industry to adapt itself to modern conditions and to keep abreast of the times. Without such reforms it becomes increasingly difficult to face the competition from rivals less hampered by Parliament.

Recent and well-modernized legislation assists electricity, derating assists coke ovens and coal mines, and the latter also are to receive marketing assistance; but gas fights on, treading an up-hill path with its unlightened load. Several aspects of this grievance were referred to in my speech at our last annual meeting, but since that date a step has been taken in the required direction. It is a short step, but it enables me to-day to return thanks for what last year I could only hope that we were "about to receive." The industry can no doubt claim to have been given a "thankful heart," though not by any means a full meal. I refer, of course, to the Gas Undertakings Act of 1929, and I feel that we may fairly regard this Act as a forerunner of other legislation for which there is a crying need. I do not propose to refer to the particular provisions of the Act, as I know they will be familiar to you; but I would mention that, in order to avoid the danger of the Bill being crowded out before the General Election, its original form, as outlined by the National Gas Council, was not proceeded with. A short, non-contentious form was substituted on the advice of the Board of Trade. That such advice was well-founded is shown by the fact that even in this form the Bill did not receive the Royal Assent till May last.

One of the more important suggestions put before the Association's Committee when considering the Bill was to the effect that the clause now appearing as section 5 of the Act should be extended to cover premises not within any scheduled area. This suggestion was, however, withdrawn, as it would be possible to obtain such powers by Special Order under section 10 of the Gas Regulation Act of 1920. Though the benefits given by this Act are of considerable value, and should not lightly be regarded, they still leave untouched many of the most vital matters as to which enabling legislation is required. The extension of the British Thermal Unit as a basis of charge is, no doubt, a desirable step, but it does nothing to enable undertakers to encourage industrial use of gas by means of more appropriate methods of charging. It is difficult to make headway in any effort to give to the nation the potential economic advantages which might be obtained by the fuller use of gas for industrial purposes. The flat-rate method of charge imposed upon undertakers has, and always must have, the practical effect of penalizing the good consumers for the benefit of the small or occasional user. It is with matters of finance that the Act has mainly dealt; and the enabling provisions of the first three sections are of undoubted value and may be regarded as a significant step in the required direction. None the less, it must be emphasized that further provisions are greatly desired, particularly such as will enable an undertaking to co-operate on more elastic lines with others. Such co-operation is, as I have already mentioned, especially desirable at this time owing to the imminence of increased competition. A further need that is felt as urgently as ever is the power to raise fresh capital and take financial interests in other similar concerns in accordance with modern commercial usage. The importance of this matter has been considerably enlarged by the increased limits laid down by the Gas Undertakings Act for the raising of both share and loan capital.

SMOKE ABATEMENT EXHIBITION.

With reference to the Smoke Abatement Exhibition at Manchester this month, the Association has lent its name to the exhibition, but no financial or other obligation is thereby incurred.

INCOME-TAX.

Another matter calling for brief mention is the question of income-tax allowances for obsolescence. The information given in the Association's circular letter on this subject will, I feel sure, be welcomed by all members of the Association.

ADVICE TO MEMBERS.

The vexed questions which so frequently arise in connection with this not over-popular subject of income-tax are matters in which the Secretary has a particularly wide experience, and it will be noticed that a large proportion of the varied matters on which his advice has been sought and freely given during the past years have dealt with this topic. The use which is already made of the facilities available to members in the way of advice on all topics connected with the industry shows that it is unnecessary for us to emphasize its value.

RETIREMENT OF MR. A. W. BROOKES.

It is with much regret that we must record the retirement from the Committee of Mr. A. W. Brookes. I understand that this is due to the fact that Mr. Brookes has changed his official duties, and is now living on the south coast, and does not anticipate being able regularly to attend the meetings of the Committee. At a later stage you will be asked to consider the election of Mr. A. Stokes to fill the place thus vacated; and I feel certain that his eminence and long experience in the gas industry will prove of great value to this Association.

OBITUARY.

I cannot conclude my remarks without referring to the great loss which the Association has suffered in the death of its Senior Vice-President, Mr. Charles Hunt. The late Vice-President was possessed of a wide and ripe experience in all matters concerning the gas industry, and both before and after his appointment as Vice-President in 1919 I have often been struck by his willing and helpful generosity in giving to any who asked the benefit of his wisdom and knowledge.

I now have pleasure in formally moving the adoption of the report and accounts.

Discussion.

Mr. R. BRUCE ANDERSON (Vice-Chairman) briefly seconded the motion. The competition put forward by furnace coke and coke oven gas would, he said, have far-reaching effects upon both the coal and the gas industry, as well as upon the utility industries of the country generally. He thought that something might be done to lessen the output of furnace coke on the market.

Mr. W. H. JOHNS (Swansea), who supported, referring to the increased coke oven competition, said that he thought that some alleviation might come in the way of the stabilization of prices.

Mr. W. PHILLIPS (Luton) and Mr. W. F. WHITTAKER (Grays and Tilbury) having referred to some of the points in the report, the motion was carried.

Dr. Charles Carpenter, C.B.E., was unanimously re-elected as President. Mr. Reginald G. Clarry and Mr. A. A. Johnstone were re-elected Vice-Presidents. A vote of thanks was pased to Mr. F. W. Goodenough for the excellent manner in which he had stated the case for the gas industry before the Gas Poisoning Committee. The Chairman referred to the half-a-century's loyal service rendered to the British Gas Light Company by Mr. A. W. Brookes, who had retired from the Committee. Mr. A. Stokes was elected a member of the Committee in the place of Mr. Brookes; and the Chairman paid a very high compliment to Mr. F. E. Cooper, the Secretary, and Mr. R. G. Cooper, the Assistant Secretary, for their excellent services.

The members of the Committee who retired under rule 12 were re-

elected (with the exception that Mr. A. Stokes was substituted for Mr. A. W. Brookes), and the General Committee is now composed as follows: Dr. Carpenter (President), Mr. R. W. Edwards (Chairman), Mr. R. Bruce Anderson (Vice-Chairman), Mr. R. J. Auckland (Cardiff), Mr. J. Ferguson Bell (Derby), Mr. C. M. D. Belton (Shrewsbury), Mr. C. F. Botley (Hastings), Mr. F. J. Bradfield (Commercial Gas Company), Mr. A. Stokes (South Metropolitan Gas Company), Mr. W. E. Caton (Oxford), Mr. R. Halkett (Sheffield), Mr. D. H. Helps (Reading), Mr. W. H. Johns (Swansea), Mr. W. S. Morland (Gloucester), Mr. W. Phillips (Luton), Mr. G. Stevenson (Long Eaton), Mr. W. W. Townsend (Colchester), and Mr. W. F. Whittaker (Grays and Tilbury).

BRITISH TAR FOR BRITISH ROADS.

Conference in Manchester.

A Meeting of the Manchester Regional Joint Industrial Gas Council and representatives of the British Road Tar Association was held on Wednesday, Nov. 6, at the Midland Hotel, Manchester—Mr. C. E. Ross, Chairman of the Manchester Regional Joint Industrial Gas Council, presiding.

In opening the proceedings, the CHAIRMAN stated that the great problem of the moment was that of unemployment. He noticed that those interested in bitumen had only four factories established in this country, and therefore they probably employed only a few hundred or a few thousand workpeople, whereas the gas industry employed at least 100,000 men. Assuming that the price of coal tar was 5d. per gallon, and that the bitumen interests were able to maintain the market against it, there would be a loss of 4 million sterling per annum to the gas industry, as well as there being a serious effect upon both the steel and the coke industries.

LT.-COL. W. M. CARR, Chairman of the Manchester District Committee of the British Road Tar Association, stated that two coke oven undertakings were now members of the Association, which originated as the result of the competition from foreign bitumen for road-making purposes while British pitch was being sent to France. The Association could now offer a product which was second to none for the making of roads, and which complied with a standard specification. Some distillers had built up a good business by standardizing their product and giving it a proprietary name. Owing to the co-operative schemes which now functioned between the tar producers and the distillers, every barrel of tar which was sold in Lancashire could be guaranteed to comply with a standard specification. A great deal of research work was now being carried out at the London Headquarters of the Association, and the members of that Research Department would be only too pleased to assist local surveyors in the solving of any of their road problems in connection with tar. A price of 6d. to 7d. per gallon was being paid for a foreign product when, for a British product of equal utility, only 4½d. could be obtained. If an additional 1½d. per gallon could be obtained for the British article, it would resolve itself into an added value of 1s. 6d. per ton for British coal.

ECONOMIC ADVANTAGES OF USE OF BRITISH TAR.

Mr. W. E. CONE, Technical Adviser to the British Road Tar Association, said the gas and coking industries, which produced 2 million tons of coal tar per annum as a bye-product, depended to a large extent upon securing an economic market for their output. The surface dressing of one mile of road required 2000 gallons of tar, which in turn was represented as the bye-product of 200 tons of coal. Therefore, the economic use of 200 tons of coal in the gas and coking industries depended upon securing a tar order for one mile of road. If this order was not forthcoming, the adjustment of prices between gas and its bye-products, or coke and its bye-products, was disturbed, with results that were not favourable either to the workers or to the public. It should be unnecessary to add that the coal miners must suffer as a result of any damage done to the gas and coking interests. Large quantities of imported road materials were being used on the roads of this country; and if British tar were used in their place, it would not only prevent a further fall in the price of tar, but it would be possible, through the increased use of tar, for the whole of the national output to be employed on the roads of the country, and for large numbers of unskilled men to find employment.

The present price of tar was such that it was the cheapest recognized form of road-making material, and an extension of its use would do much to allay the anxiety of the gas industry, which foresaw the possibility of any loss of the revenue obtained from the sale of tar raising the price of gas, reducing its consumption, cutting down the demand for coal, and thus affecting the already serious unemployment position. The same consideration held true if the coking industry lost its tar market because of the use of bitumen on the roads. Refined tar had already been employed for a number of years in the construction and maintenance of the roads of the country, and had proved to be a highly effective material for the purpose. There could be no doubt that the use of British tar on British roads was vital to the gas, coking, coal, and steel industries, and it would be folly, therefore, to add to their present troubles by using foreign bitumen in preference to tar. Recently the British Engineering Standards Association and the Minister of Transport had officially accepted the Specification of the British Road Tar Association for No. 1 and No. 2 tars. Therefore, Surveyors in the future would demand and would purchase only tar which conformed to those standards.

COST COMPARISON.

The maintenance of roads by means of tar offered a wide field of exploitation at an economic price to the highway authorities of the country. In the County of Hampshire the surface dressing of roads with tar had been carried out at 1·8d. per yard super for the whole of the work done, while a smaller area treated with bitumen in the same county cost 2·7d. to 3·6d. per yard super. It could be stated with confidence that tarmacadam had been proved to be one of the most highly effective forms of road surfacing required for the conditions of modern transport. Very many tarmacadam roads throughout the country had now been in use for twenty years, and, given an annual or biennial tar spraying, were in as good condition to-day as they were when first laid down. This was a testimony not only to the merits of British tar, but also to the successful operations of the tarmacadam manufacturer and the tar spraying contractor.

Fourteen years ago, Mr. Gibson, the County Surveyor of Perthshire, laid down a series of experimental stretches of road on the Great North Road near Dunblane. There were nine sections, and both bitumen material and tar were used. His report at the end of that period was that the best section was one which was constructed of tarmacadam and the surface sealed with tar, and that not only was it the best from the point of view of wearing properties, but also it was the cheapest—its cost being 4s. per yard super over the whole period of the life of the road, as compared with 12s. per yard super for the competitive material. It was the intention of the Association, if at all possible, to take an active part in the work of the Chair of Highway Engineering which had recently been established at the University of London under Prof. Clements. One endeavour of the Association would be to found a research fellowship, so that the Association might have a research chemist working on behalf of the tar industry as a whole, under the auspices of the Professor at the University. The Association were also considering the possibility of appointing a chemist who would work in the laboratories of one of the constituent members of the Association, and who would be engaged in practical experimental work under the guidance of a committee. It was hoped that the work would be of practical value to the industry as a whole.

The Association had laid an experimental section of tarmacadam on a main road leading out of London. Special refined tar was used, and also a carefully graded aggregate. For two years that stretch of road had been subjected to a daily traffic of 25,000 tons, and, with the exception of a few minor repairs, it had remained in the same good condition as when it was first put down.

Mr. W. J. SMITH (Bolton) said that more financial support was necessary for propaganda work in connection with the use of tar for road construction.

Mr. GEORGE DIXON (Lancaster) thought that a summary report of the activities of the Association should be sent periodically to road surveyors throughout the country.

Answering a question by Mr. W. H. Holding, Mr. CONE stated that only 5 p.ct. of roads drained into fishing streams in this country, and surely there could be no objection to the remaining 95 p.ct. being treated with British tar, though he did not regard the statement that tar had a toxic effect upon fish life as being well founded. At any rate, every effort was being made to produce a definitely non-toxic tar which would be suitable for roads near fishing streams.

Answering another questioner, Mr. Cone said that the amount of tar used on the roads in this country at the present time was approximately 700,000 tons. He agreed that surveyors in rural districts were more favourable to the use of tarmacadam than bitumen.

Mr. R. J. MCBEATH (Sale) said that for some years past, in season and out of season, he had been preaching the desirability of using British tar for British roads, and in the result a large quantity had been used over an area of probably 2300 miles.

Councillor J. WILLIAMS (Manchester) thought there was no foundation for the belief that tar surfaced roads had a toxic effect upon fish.

Mr. WILL HUGHES (National Union of General Workers) emphasized the desirability of tar being produced which was of a standard specification for road-making purposes. He thought there had been as many failures in bitumen surfaces as there had been in tarmacadam surfaces.

The CHAIRMAN announced that, owing to illness, Alderman Phillips, of Salford, had been unable to attend the conference, and that a communication had been forwarded to him regretting his absence, and expressing a sincere hope for his speedy recovery to good health.

LUNCHEON.

By invitation of the Lancashire and Cheshire Gas Exhibit Committee, the representatives present at the conference were invited to luncheon, at which Mr. Ross presided.

Mr. W. B. MCLUSKY, President of the Manchester District Institution of Gas Engineers, proposed the toast of "The Manchester Regional Joint Industrial Gas Council," which was responded to by Mr. Ross and Lt.-Col. CARR.

Councillor JOHN WILLIAMS, of the workmen's side of the Manchester Regional Joint Industrial Gas Council, proposed the toast of "The Visitors," which was responded to by Mr. ARNOLD MARSH, Hon. Secretary of the National Smoke Abatement Society, and by Mr. HEYWOOD, of Allied Newspapers, Ltd., the promoters of the Smoke Abatement Exhibition at Manchester.

A vote of thanks to the Chairman for presiding concluded the proceedings.

GAS POISONING COMMITTEE.

[For Earlier Evidence, see "JOURNAL" for Oct. 16, 23, 30, and Nov. 6.]

Tuesday, Nov. 5.

Prof. J. S. Haldane, F.R.S., one of the three Gas Referees, Director of the Mining Research Laboratory, University of Birmingham, and ex-President of the Institution of Mining Engineers, 1924-28, gave evidence before the Gas Poisoning Committee.

In answer to the CHAIRMAN,

Prof. *Haldane* said that, having read the evidence of Dr. Stevenson as to the great increase in suicides from gas poisoning, and the apparent distinct increase in accidents from the same cause, he agreed with the conclusions arrived at. The apparent increase in accidents, in so far as it was not due to increased use of gas, was probably due entirely to cases of suicide being attributed to accident. He was also in general agreement with Dr. Oddie in his conclusions as to the increase in suicides from gas poisoning.

As regards the use of carburetted water gas, he saw no reason for modifying the conclusion he expressed in giving evidence before the Pearce Committee. The substitution of incandescent mantles for the old flat-flame burners diminished greatly the risks from burners in bedrooms; and in view of the advantages of water gas plant as a stand-by, and of steaming with vertical retorts, he expressed the opinion before that Committee that, if any limitation was imposed on the percentage of carbon monoxide, the limit need probably not be lower than 20 p.ct. This was only a rough guess, however. At the same time he had stressed the desirability of further experiments on this point. Seeing that gas undertakings in this country were very carefully and ably managed, and that their interests were now practically identical with those of the public, he doubted whether any legal limitations were needed. He wished, however, to express his emphatic dissent from the conclusion reached by the Pearce Committee that the percentage of carbon monoxide in the gas does not affect most seriously the risk of accident. He thought the Committee were entirely misled by some amazing official evidence from America. The frequency of accidents by poisoning when undiluted carburetted water gas was used there was notorious; and there was no reason to doubt that there would be a more or less similar frequency in Great Britain in similar circumstances.

The CHAIRMAN: This is a most important piece of evidence.

Continuing, Prof. Haldane said that in spite of his advice, and of all the existing evidence as to the dangers of a high percentage of carbon monoxide, the Pearce Committee did not carry out a single experiment to test their conclusions, which fact was, he thought, calculated to mislead the gas industry very seriously. During the last few years the proportion of water gas added to public supplies had diminished rather than increased, as shown by the Board of Trade returns, though possibly there may have been a very slight increase in the percentage of carbon monoxide, owing to the more extended use of vertical retorts with steaming. This effected a distinct economy in heat, and was thus advantageous. Dealing with the inspection of gasfittings, Prof. Haldane agreed with the previous evidence that the more the gasfittings were under control or inspection by the skilled officers of gas undertakings, the less liability there would be to accidents; and as to the importance of good fittings, he referred to the Report presented to the Board of Trade by Mr. Butterfield in 1924.

Speaking of the effect of small percentages of carbon monoxide on accidents, witness observed that, even with 15 p.ct. of carbon monoxide, the total number of such cases was still quite small; but with 30 p.ct. it became very serious, as shown by American and other experience, and he did not think the public in this country would ever stand such an increase. At the same time, it would be well if the present Committee could institute further experiments with modern gasfittings, as to the influence of percentage of carbon monoxide on risks of accident.

As regards treatment of persons found unconscious or disabled by escapes of gas, Prof. Haldane drew attention to the great improvement which had been introduced by adding carbon dioxide to the oxygen or air breathed during revival of the patient. In American cities, where cases of poisoning were very frequent, efficient services, ready night and day, had been established by the gas companies and other organizations for promptly treating cases of poisoning, by means of oxygen containing about 5 p.ct. or more of carbon dioxide, as recommended by Prof. Yandell Henderson. The carbon dioxide hastened greatly the elimination of carbon monoxide from the blood by stimulating the breathing, and also acted immediately by increasing the rate of circulation.

Answering questions by the Committee regarding dangerous escapes of gas from cracked or otherwise leaky mains or service pipes, witness said he did not see how these could be prevented altogether. Where, however, there was an air-tight roadway, some means of escape of gas at places where its smell would be detected readily by passing police or other persons would diminish the risk and help towards its prompt localization. Further, a better method than digging up along a street, for localizing a leak, could be organized by gas undertakings. By no means all the explosions and cases of poisoning by gas in houses and along the lines of streets were due to coal gas. Some were due to short circuits in electric cables laid in bitumen, and others to gases formed by anaerobic fermentation. In the case of the Holborn explosion, for instance, the gas which exploded was probably hydrogen from anaerobic fermentation in the subsoil; and he regretted that the source of the gas in that case was not more thoroughly investigated.

USE OF GAS IN PRINTING.

Fine Advertisement for the Industry.

The recently published Printing Supplement of "The Times" gave excellent evidence of the great part played by gas in the important industry of printing.

The progress made by gas in the printing industry is traced from the early days when its only use in the printing works was as a method of illumination, by means of fish-tail burners which flared away, and, if one attempted to regulate them by means of the tap, more often than not the flame vanished altogether, up to the present time when modern gas engines of large size supply the power for more than fifty machines of varied uses which are to be found in an up-to-date printing works. Tests from time to time have convinced the proprietors that the power provided in this manner is most economical. But not for power purposes alone, by any means, is gas the predominant fuel in the printing industry, for so great are the strides that have been made in gas illumination that to-day almost any printer will say that he prefers to work by gaslight rather than by any other artificial illuminant. From the fish-tail burners developed, year by year, new and better burners, and ultimately the incandescent mantle arrived. Thus to-day, in its most modern form, and with the added advantage of long-distance switches, many compositors will say that nothing can equal the light gas gives for softness and good diffusion.

In the Printing Supplement also two fine full-page colour plates appeared on behalf of the gas industry. One, produced by the British Commercial Gas Association, was of a futuristic nature, giving an impression of a large city, with St. Paul's Cathedral predominating the background, half of the scene showing smoking chimneys, drooping flowers, begrimed building, and an overcast sky in the form of a great curtain gradually being drawn aside by the more general use of gas, to give place to a beautiful blue sky above, and clean, white chimneyless buildings, and flowering vegetation. The whole effect of the representation, touching as it did closely the vital aim of the gas industry—a purer atmosphere—was striking in its appeal, and showed forcibly how gas is doing a great work in banishing the curtain of smoke that keeps the sunshine from our cities.

The other colour plate was a fine reproduction of a more commercial nature, by the Gas Light and Coke Company, illustrating the many and various ways in which gas can be, and is being, used in the printing industry, from the little gas rings used in the process rooms to the huge gas-heated autoplate casting machines and gas-fired multi-tubular boilers. And thus it is shown how the little gas flame, issuing from a home-made contrivance, capped by his wife's well-worn thimble, which was Murdoch's triumph of over a century ago, has added one more to our modern miracles. To-day millions of gas flames, of magnitude and intensity undreamed of by that great pioneer, enable the printed page to be produced with speed, economy, accuracy, and beauty.

Tenders for Uxbridge Stock Issue.—The tenders for the £20,000 ordinary stock and £33,700 5 p.ct. perpetual debenture stock which was offered by A. & W. Richards, of 37, Walbrook, E.C. 4, on behalf of the Directors of the Uxbridge, Maidenhead, Wycombe, and District Gas Company, were opened on Nov. 5. The tenders for the former ranged from £105 per £100 down to the minimum of par, and for the latter down to the minimum of £90 per £100. The average prices obtained for the whole of the issue were £100 15s. 1d. and £90 5s. p.ct. respectively.

Newton Chambers and Hoyland Coal Amalgamation.—Newton Chambers & Co., Ltd., and the Hoyland Silkstone Coal and Coke Company, Ltd., have made application to the Court of Railway and Canal Commission for the confirmation of a scheme for their amalgamation under the Mining Industry Act, 1926, Part I. The scheme provides for the transfer to, and vesting in, Newton Chambers & Co., Ltd., of the undertaking of the Hoyland Silkstone Coal and Coke Company, Ltd., and for the winding-up and dissolution of the last-mentioned Company.

GAS CENTENARY AT DUNFERMLINE.

A Hundred Years of Progress.

One hundred years ago gas lighting was first introduced into Dunfermline, and the memorable anniversary is marked by the Corporation in an illustrated brochure issued on Nov. 1.

Dunfermline, it states, was one of the first eight or ten Scottish towns to adopt the new illuminant. The Dunfermline Gas Light Company was formed in 1828, and the gas-works buildings were erected at Priory Lane. According to Dr. Henderson's "Annals of Dunfermline," the works were completed on Oct. 26, 1829, and the gas turned on on the 28th.

The highest scale of charges at that time was 12s. per 1000 c.ft.; Dundee's first price being 15s., and that of Perth 12s. 6d.

An interesting excerpt from the minutes contained in the brochure is that a meeting of the Directors was held at ten o'clock at night on Feb. 7, 1830, to consider serious damage to gas pipes in the works caused by frost.

Dunfermline's connection with aviation in its infancy is proved by a minute in which it is recorded that on Aug. 1, 1831, it was agreed to make a special charge of £8 10s. "to Mr. Green for 20,000 c.ft. of gas for his balloon."

By 1843 the price of gas had been reduced to 7s. 6d., which was very moderate for those days, yet the Company could pay a dividend of 12½ p.ct. Up to 1894 the Company carried on business at Priory Lane, but, those works becoming too small, they removed to new works at Grange Road.

In the beginning of 1896 the Council resolved to acquire the Company's whole undertaking. The price in the first year of Corporation management was 3s. 7d., and thereafter it was gradually reduced, being as low as 2s. 3d. Coal costs are now nearly double what they were at that time.

The production for the year ended May 15, 1929, was 359¾ millions, which demonstrates that the general use of gas is still increasing in the city and neighbourhood, when allowance is made for the reduction in consumption at Rosyth Dockyard.

Large sums have been spent in recent years in modernizing and extending the works, the amount so spent since 1920 being fully £140,000.

ANOTHER SCOTTISH CENTENARY.

Official Inspection at Alloa.

The centenary of Alloa Gas-Works was also celebrated on Nov. 1, when an official inspection of the works was made by the Provost, Magistrates, and Town Council.

At a social function following the inspection, at which Captain J. P. Younger presided, Provost Moir sketched the history of the gas undertaking. A Company was formed in 1828 with a capital of £3500, and towards the end of the following year works were established at Kelliebank, and gas produced and sold to consumers at 12s. per 1000 c.ft.

The undertaking prospered, and 52 years ago the Burgh Commissioners acquired the works at £23,000. Since then great extensions and developments have taken place. The undertaking is considered one of the most up-to-date in the country, and the present Manager, Mr. J. W. Napier, is President of the North British Gas Managers' Association. The price of gas has been reduced to 3s. 5d. per 1000 c.ft.

During the social proceedings, Provost Moir, whose family has been associated either directly or indirectly with the works, was presented with a slab of Brazilian onyx marble containing two pheasants in bronze as a memento of the occasion. The presentation was made by Mr. Frank Scobie, the oldest employee at the works.

During the inspection of the works Provost Moir, on behalf of the workers, presented Fireman Barney Sallon on his retirement with a calabash pipe and a set of razors.

The Provost said that Barney had a long term of service with the gas-works. In 1878 he joined the 72nd Highlanders, and was in the historic march from Cabul to Kandahar with Lord Roberts. He had served 10 years in the Reserve, and was now 71 years of age.

COMBUSTION AND SMOKE ABATEMENT.

By E. W. L. NICOL, Assoc.M.I.E.E., F.Inst.F.

Résumé of Lecture delivered at the Royal Sanitary Institute on Nov. 4 to Smoke Inspector Students.

In the course of his lecture, Mr. Nicol said that smokeless combustion and efficient combustion were largely synonymous terms. The main object should be to maintain a high temperature head by excluding from the furnace all air in excess of that necessary for the complete combustion of the fuel.

Owing to the use of from 100 p.ct. to 150 p.ct. of excess air, as in ordinary coal-fired boiler practice, 6 to 8 p.ct. of CO_2 in the flue gases was usual, and often more than the average, the corresponding furnace temperatures being too low by 1000° Fahr. to effect rapid ignition and complete combustion of the volatile gases, with consequent smoke formation and waste of fuel, amounting to 25 p.ct. or more.

The first principle to be observed in stoking should therefore be to exclude from the furnace, as far as is practicable, all cold air in excess of that necessary to burn the fuel at the highest possible temperature. But this quantity of air falls short of that required to burn raw coal completely. This happens almost invariably where the fuel used is bituminous coal of the ordinary description. The volatile matter is liberated very rapidly when the coal is thrown into the furnace. The gas evolved requires for its combustion considerably more air than an equal quantity of the fixed carbon or coke remaining on the grate, which needs, in practice, only a comparatively small quantity (about 30 to 50 p.ct.) in excess of that theoretically required; so that the "two-stage" combustion of bituminous coal is at best a compromise between the quantity of air necessary to maintain the highest temperature in the furnace and that necessary to effect complete or smokeless combustion. Gas coke, which is almost entirely devoid of hydrogen and volatile matter, requires less than half the amount of excess air usually allowed for coal, and gives 14 to 16 p.ct. of CO_2 in ordinary boiler practice, with correspondingly high temperature and radiation. That is one reason why coke is almost invariably used where high temperatures are required, as in steel-melting. A well-known cause of incomplete combustion and smoke formation is inadequate combustion space. Coke can most advantageously be consumed in close proximity to, or in actual contact with, the heating surfaces, with the maximum radiant effect.

[The students will later be accompanied on a tour of inspection and demonstration at the new London County Hall, where the coke-fired central heating and steam boilers will be seen in operation, and also the "Metro" open coke fires which have recently been installed in the main entrance halls by the London County Council.]

NEW SHOWROOMS AT DOUGLAS.

Interesting Exhibits.

The new showrooms of the Douglas Gaslight Company in Victoria Street, Douglas, were opened to the public on Nov. 4, and the limited space in the basement demonstration room, in which Mr. R. Q. Hampton (one of the Directors of the Company) spoke a few words of welcome to those present, was taxed to its utmost capacity. About 200 people attended at the opening.

Mr. Hampton remarked that the Company had been looking for suitable showrooms for quite a long time in order that they might be able to show the public the latest gas appliances and get more in touch with the consumers of gas. During the last few years, rapid strides had been made in the manufacture of gas appliances, and very few people in Douglas were aware of the number of improvements awaiting them and which could be placed at their disposal by the local Gas Company. There were geysers that would heat water almost instantaneously and supply hot water continuously, and the new exhibits would be found to be not only utilitarian, but also really excellent pieces of furniture. The showroom was in a central position and would be very handy for the paying of gas bills. Mr. A. R. Bissett, the Manager, had also put on the market a brand of coke which, while they did not claim that it would make coal obsolete, possessed wonderful heating properties. The Manager was always available and ready to give advice to consumers on all subjects connected with the activities of the Gas Company, and it would be possible for people to get enlightenment on the uses and operation of any article of gas consumption which was not included in their range of exhibits. He did not think that any person engaged in catering for visitors, whether in boarding-houses, restaurants, or elsewhere, would care to undertake that catering without the use of gas. It was the Company's wish to serve the consumers even better than they had done in the past, and there was one direction in which he thought gas could be employed successfully to a much greater extent than obtained at present. On wet days in the season people could be seen going into the boarding-houses in a bedraggled condition, and in many instances they had no warm fire to sit at and be comfortable. More use could be made of their gas fires with a penny or a shilling in the slot meter, which could be placed in the visitors' own rooms. There was nothing more depressing than a wet day when a person was on holiday, and in many visiting resorts a practice was made of having gas fires available in every room of boarding-houses so that the visitor, by putting a 1s. in the slot, or by arrangement with the management, could have the use of the gas fire whenever he wanted. The prices of their exhibits were within the reach of all.

Following the informal opening of the showrooms, Miss Kathleen Eason, Diplomee of the National Society Training College, London, who has been specially engaged by the Gas Company, lectured on cooking with the modern gas stove, and gave practical demonstrations, which were continued every day that week at 3 p.m. and 7.30 p.m. Miss Eason has for some time past been acting as demonstrator for the biggest combine of gas stove appliance makers in the country. After the demonstration those present were entertained at tea.

The housewife who visits the Gas Company's new showrooms will find much to interest her, and can also have the advantage of expert advice on the use of any of the articles on show, which include labour-saving appliances such as geysers, gas stoves, smaller gas rings, gas fires, and the new "Wonder Washing Machine," which excited considerable interest at the opening. The mottle enamelled finish on the cookers rendered them distinctly pleasing to the eye. The Gas Company's coke was shown providing more heat than is usually required in any house, thus bearing out the contentions of those responsible for the marketing of this product.

LIGHTING OF WESTMINSTER.

Gas Light and Coke Company's Allowance.

The Traffic and Public Lighting Committee of the Westminster City Council reported to that body, at its meeting on Thursday (Nov. 7) last, that they had had before them a letter from the Gas Light and Coke Company, dated Sept. 27, offering to make the Council an allowance of £238 16s. in lieu of the painting of the public gas lamps this year. It was stated that the amount was calculated at the same rate as the amount allowed in 1927, and was slightly increased owing to a variation in the number of lamps, the total number of high and low pressure lamps this year being 3021, against 3019 in 1927. For some years, in order to secure uniformity in the painting of street iron-work, the Council had undertaken the cleaning and painting of the lamp columns, though that duty devolved upon the several lighting contractors pursuant to their respective contracts. The City Engineer had reported that the allowance now offered by the Company was based on previous allowances and was considered reasonable. The Committee recommended that the Company's offer be accepted. The Council agreed.

Councillor M. E. F. CREALOCK asked the Chairman whether the Committee would reserve an amount in their estimates for the coming year for the purpose of equalizing the lighting, particularly in the secondary streets of the city. The main streets were exceptionally well lighted, but the secondary streets were not up to the standard that one would expect in the City of Westminster.

Councillor H. P. STEPHENSON, Chairman of the Committee, said the suggestion was a good one, and he would bring it before the Committee for their careful consideration with a view to seeing whether the lighting of the secondary streets could be made as good or better than that of the others.

Alderman F. G. RYE doubted whether there was any necessity to go to additional expense. He had never heard anyone complain of the lighting of the secondary streets; it might not be as good as in the main streets, but it had given satisfaction for a great number of years, and there was no reason why they should lay an additional burden on the ratepayers at the present moment, of whose money they were the custodians and trustees. If there had been complaints from the ratepayers or the police of the insufficient lighting, it would have been another matter.

FRAUD BY NEWARK GAS EMPLOYEE.

Prison for Series of Embezzlements.

On Nov. 4, at the Newark Borough Police Court, Albert Edward Lidgett, a clerk in the employ of the Newark Gas Department, appeared before the magistrates, charges against him being that on Feb. 7 he embezzled the sum of £20 18s., and on Feb. 12 the sum of £8 7s. 8d., and on June 20 a further sum of £12 9s. 8d., received by him on account of his employers.

Defendant pleaded guilty to all the charges, and asked to be dealt with summarily.

In outlining the facts of the case, the Town Clerk (Col. H. Tallents) said it was not a case of theft on the spur of the moment, but was really a very clever system of fraud carried out over a very considerable period of time, and must have been premeditated and carried out with a good deal of care and knowledge of routine in the office.

The accused was employed by the Newark Gas Company, until the undertaking was taken over by the Corporation, and since then he had been employed by the latter as a collector.

In the course of his duties he collected gas and electricity moneys, as well as house rents. He was supplied with a book of receipt forms, with counterfoils and a double carbon sheet, but, instead of giving an exact duplicate of the receipts, his counterfoils were made out for amounts less than those which he received. In order to enable this to be carried out, the accused had been intercepting demand notes asking for payment of arrears, and had substituted for them demand notes made out by himself, so that those to whom they were sent should not lodge a complaint. As a matter of fact the matter came to light in this way. One of the authentic demand notes was received by a ratepayer who had paid to Lidgett the amount for which he was being asked, and he complained to the office, and produced the defendant's receipt.

Lidgett, who asked for 14 similar charges to be taken into account, appealed for leniency.

The Town Clerk said the total amount involved in the frauds was £109 14s. 1d., and, so far as the ratepayers were concerned, the loss was covered by insurance.

After a short retirement, the Chairman said the magistrates looked upon it as a very serious case, and he would have to go to prison for three months with hard labour, on each of the three charges, the sentences to run consecutively.

Oriental Gas Company, Ltd.—At the meeting on the 20th inst., the Directors will report that the revenue from the sale of gas and rentals for the year ended June 30 shows an increase of £1335, but the receipts from residuals are slightly lower than those of the previous year, due to the still depressed state of the market. The receipts from all sources, excluding exchange, show an increase of £1178. The profit on exchange is more by £256. There has been an increase in the sale of gas of slightly under 2½ p.ct., and an addition to the number of gas appliances installed during the year of £1144. The Directors recommend the payment of a dividend at the rate of 4½ p.ct., *less* income-tax, making, with the interim dividend of 3½ p.ct., *less* tax, a total dividend of 8 p.ct., *less* tax, for the year.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate.

LONDON, *Nov.* 11.

There are no changes to report in the prices of tar products.

Pitch is still about 47s. 6d. per ton f.o.b., and creosote for export 6¾d. per gallon f.o.b.

White spirits are also unaltered; pure toluole being 2s. 3d. to 2s. 4d. per gallon, 95/160 solvent naphtha about 1s. 5d., pure benzole about 1s. 11d., and pyridine bases 3s. 9d. to 4s. per gallon.

Tar Products in the Provinces.

Nov. 11.

There has been no variation in the markets for tar products during the last week.

Pitch continues to be sold for delivery right up to the end of 1930 on the basis of 47s. 6d. f.o.b.

Creosote oil is quiet; but shipments are going out regularly.

Crude carbolic is still very firm; 2s. 6d. is reported to have been paid for delivery January/June.

Crystals are quiet; and at the high prices asked for near delivery, there is not very much business doing.

Cresylic acid is a little firmer; but the inferior grades are very difficult to dispose of.

Water-white products are steady. Benzole is in good demand, and a considerable quantity of solvent naphtha has been sold for delivery to the autumn of next year.

The average prices of gas-works products during the week were: Gas-works tar, 25s. to 30s. Pitch—East Coast, 47s. 6d. f.o.b. West Coast—(f.a.s.) Manchester, 42s. to 42s. 6d.; Liverpool, 45s. 6d. to 46s. 6d.; Clyde, 45s. 6d. to 46s. 6d. Toluole, naked, North, 1s. 7½d. to 1s. 8½d. Coal-tar crude naphtha, in bulk, North, 9d. to 10d. Solvent naphtha, naked, North, 1s. 3d. to 1s. 3½d. Heavy naphtha, North, 1s. to 1s. 0½d. Creosote, in bulk, North, liquid and salty, 3½d. to 3⅝d.; low gravity, 2d. to 2¼d.; Scotland, 3¼d. to 3⅜d. Heavy oils, in bulk, North, 5½d. to 6d. Carbolic acid, 60's, 2s. 5½d. to 2s. 6¾d. prompt. Naphthalene, £12 to £14. Salts, £5 to £5 10s., bags included. Anthracene, "A" quality, 2½d. per minimum 40 p.ct., purely nominal; "B" quality, unsaleable.

Tar Products in Scotland.

GLASGOW, *Nov.* 9.

The market is quiet at the moment, but stocks being comparatively low prices are steady. Coal tar pitch, which is generally being shipped in fair quantities at this season, is inactive.

Pitch.—Stocks are low, and the price is nominal at 45s. to 47s. 6d. per ton f.a.s. Glasgow. Small quantities command 2s. 6d. to 5s. per ton extra.

Tar.—A firm market, inclined to rise. To-day's value is 3¾d. to 4⅜d. per gallon *ex* works in buyers' packages.

Creosote.—There is a steady demand for home trade. Gas-works and coke oven, 4¼d. to 4⅜d. per gallon. Light oils, 3½d. to 4d. per gallon. Neutral oil, 3½d. to 4d. per gallon.

Cresylic.—Ordinary low-boiling grades are scarce. 97/99 p.ct. pale, 1s. 10d. to 1s. 11d. per gallon; 97/99 p.ct. dark, 1s. 9d. to 1s. 10d. per gallon. 99/100 p.ct. pale, 2s. 2d. to 2s. 3d. per gallon. High boiling, 2s. 1d. to 2s. 2d. per gallon.

Crude Naphtha.—Scarce. 6d. to 6½d. per gallon, according to district.

Solvent Naphtha.—90/160, 1s. 2d. to 1s. 3d. per gallon; 90/190, 1s. 1d. to 1s. 2d. per gallon.

Motor Benzole.—1s. 5⅝d. to 1s. 6½d. per gallon.

Pyridine.—90/160, 3s. 3d. to 3s. 6d. per gallon. Heavier grades, unsaleable.

Benzole Prices.

The following are considered to be the market prices to-day:

	s. d.	s. d.	
Crude benzole	0 10	0 11	per gallon at works
Motor ,,	1 5	1 6	,, ,, ,,
90 p.ct. ,,	1 7	1 8	,, ,, ,,
Pure ,,	1 10	1 11	,, ,, ,,

Gas Exhibition at Burnley.—During the past week the Burnley Corporation Gas Department have been holding a gas exhibition in the Mechanics' Institution Assembly Hall. The opening ceremony was performed by the Mayor (Alderman H. Lees, J.P.), who was told in a subsequent vote of thanks that if he wanted to change his occupation he would make a very good gas canvasser. The Chairman of the Gas Committee, Councillor W. F. Witham, presided at the ceremony. Mr. Witham remarked that since the last exhibition, three years ago, they had increased the sale of gas cookers, gas stoves, and boilers, and consequently the sale of gas. They were now selling from their showrooms £24,000 worth of boilers and heating apparatus. Large sums of money derived from the Department were being spent on health and maternity and child welfare, and also in saving to the cleansing department. They were hoping that with a further increased consumption of gas they would be able to help those departments to perform their duties more efficiently. The consumption of gas had increased so much that they had to lay larger mains at a cost of £25,000. The Mayor pointed out that from 1864 to 1917 the Department paid over to the rates £297,426, which was almost the entire cost of the fine new works in Oswald Street. Only 5 p.ct. of the present total product was used for industrial purposes, and he appealed for a wider use of gas for industry.

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Ironfounders to H.M. The King.

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FOUNDED 1759.
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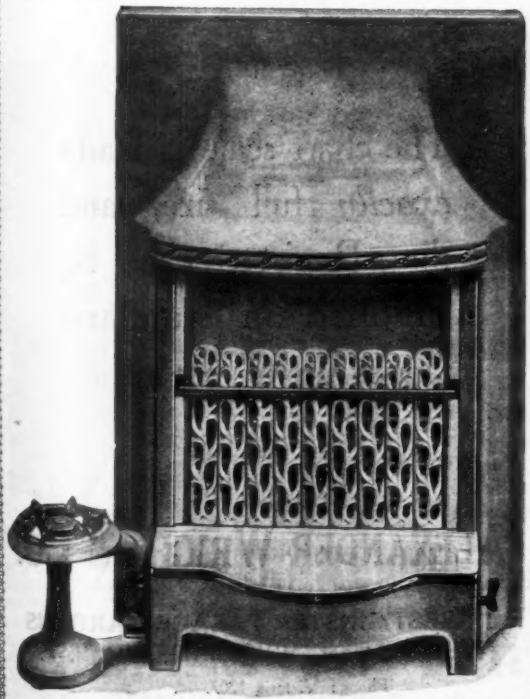


No. 503 Gas Fire with Pedestal Boiling Burner.

COAL TRADE REPORTS.

From Our Own Correspondents.

NORTH-EAST COAST.

The prompt market, generally speaking, is uncertain, and inclines to weakness. Shipping has been interfered with by the weather conditions during the past week, and many collieries with contract orders for which tonnage could not be obtained had to seek business to keep the pits working. The forward position remains mainly unchanged, but business is quiet owing very largely to the general uncertainty as to what will be the position next year as to hours, wages, and selling schemes.

Northumberland steams are slightly easier than of late, but 16s. 9d. f.o.b. is still quoted for best sorts, and there appears to be fairly good demand. Gas coals are quiet, especially seconds, which, while nominally 15s. 3d. to 15s. 6d., have been offering down to 14s. 9d. for quite good brands. Wear Specials ask 17s. 3d. to 17s. 6d., and best qualities 16s. 6d. to 16s. 9d. Coking coals have been seriously affected by the tonnage position, and are no better than 15s. 3d. for good sorts, and 14s. 9d. for second qualities. Durham bunkers are very quiet; best qualities quoting 15s. 6d. to 16s., and seconds 14s. 6d. to 14s. 9d.

Gas coke is in excellent demand, and the price is maintained at 25s. to 25s. 6d. f.o.b. for shipment.

YORKSHIRE AND LANCASHIRE.

The strong inquiry on export account for best hards continues; but secondary sorts are easier. Slacks continue in fairly good request with the exception of coke-making slacks, for which there is slightly less pressure. The supply of industrial fuel keeps good, and recent prices are maintained. Furnace coke remains in fairly good request, with quotations of 23s. to 24s. per ton. There is no alteration in the bunker fuel trade. The production of house coal is fairly well cleared, and values remain firm.

The following are the Humber bunker and export prices, f.o.b. usual shipping ports:

South Yorkshire Hards, Association, bunkers 19s., export 18s. to 18s. 6d.; screened gas coal, export 18s. to 18s. 6d.; washed trebles, export 17s. 9d. to 18s. 3d.; washed doubles, bunkers 18s. 6d.; export 17s. to 18s.; washed singles, export 15s. 9d. to 16s. 3d.; washed steam smalls, bunkers 15s. 3d. to 15s. 9d.; export 14s.; washed coking smalls, export 14s. 6d. to 15s.; rough slack, bunkers 13s. 6d. to 13s. 9d., export 12s. 6d. to 13s.; smithy peas, export 18s. 6d. to 19s. 6d.

West Yorkshire—Hartley's, bunkers 17s. 6d., export 17s. to 18s.; screened gas coal, export 18s. to 18s. 6d.; washed trebles, export 17s. to 18s.; washed doubles, export 16s. 3d. to 16s. 9d.; washed singles, export 15s. 3d. to 15s. 6d.; washed smalls, bunkers 14s. 3d. to 14s. 9d., export 13s. 6d.; unwashed trebles, export 17s. to 17s. 9d.; unwashed doubles, export 15s. to 16s.; rough slack, bunkers 12s. 9d. to 13s. 3d., export 11s. 3d. to 11s. 9d.; coking smalls, export 11s. 6d. to 12s.

Derbyshire and Nottinghamshire—Top hards, bunkers 19s., export 18s. to 18s. 6d.; cobbles, export 17s. 6d. to 18s. 6d.; washed trebles, export 17s. 9d. to 18s.; washed doubles, bunkers 18s. 3d., export 17s. to 17s. 3d.; washed singles, export 16s. to 16s. 6d.; washed smalls, bunkers 15s. 3d. to 15s. 6d., export 14s. to 14s. 6d.; unwashed doubles, export 16s.; rough slack, bunkers 13s. to 14s., export 11s. 6d. to 12s. 6d.

Yorkshire, Derbyshire, and Nottinghamshire—Screened steam coal, bunkers 17s. to 18s., export 16s. 6d. to 17s.; gas coke, export 25s. to 26s.; furnace coke, export 23s. to 24s.; washed steam, Goole (West Yorkshire), bunkers 17s. 3d.; Hull (West Yorkshire), bunkers 17s. 6d.; Hull (South Yorkshire), bunkers 18s., export 17s. 6d.

MIDLANDS.

The market is not strong, but it is not so weak as it was down to the first week in November. Manufacturers are keeping a close watch on the negotiations which are proceeding between the coal industry and the Government. It is feared the result will be to increase costs; but thus far sales have been affected very little.

Indirectly trade is disturbed by the uncertainty which prevails. This is especially evident in the iron and steel industry. The stringency in the coke market has not been relieved, notwithstanding that several blast furnaces are being stopped and the future of others is precarious. Reduced activity is principally apparent in the basic branch.

There is a somewhat improved demand from the malleable foundries for annealing coal, which commands 20s. to 22s. A better inquiry for slacks has allayed fears of unbalancing at some of the pits. Business is done at 5s. 6d. to 9s., according to quality. "D.S." nuts are in moderate request round 12s. Bakers' nuts remain at 18s. to 22s.

The seasonal expansion in the consumption of gas coal is only faintly discernible in current business; but values are very firm in view of the unsettled basis on which the mining industry rests and the reactions which are apprehended in connection with the marketing schemes.

Coke-Oven Gas for Paris.—It is reported that a company is being organized for the construction of a coke oven gas pipeline 120 miles long between the Lens coalfield and Paris. The capital will be in the neighbourhood of 120,000,000 francs. For some time past Lille, Roubaix, Tourcoing, and Douai have been drawing part of their gas requirements from the colliery coke-oven plants. The Douai Gas Company, for instance, have found it possible, as a result, to reduce the price of gas to consumers from 75 centimes per cub.m. to 54 centimes.

TRADE NOTES.

Bamag-Meguin Perforated Plates.

A new catalogue has recently been issued by Messrs. Bamag-Meguin (Great Britain), Ltd., of Broadway Buildings, Westminster, S.W. 1, giving a description of their perforated plates. The catalogue contains summarized information of Bamag-Meguin perforated plates of all varieties and suitable for many purposes, including armature works, leather works, lifts, &c., as well as for crushers, gratings, filter pipes, and so on.

Exhibition of George Kent, Ltd., Meters at Luton.

Messrs. George Kent, Ltd., of Biscot Road Works, Luton, are exhibiting gas meters—particularly the shunt meter—both for station measurement and on district supply mains—at an Engineering Exhibition held at Olympia Exhibition Hall, Bradford, from Nov. 6 to 16. The firm showed also the balanced recorder and curved tube manometer, representing respectively diagram and indicator meters for the measurement of low-pressure gas or air, as adopted successfully at many gas-works.

Vibro Conveyors.

With reference to the recent announcement by Underfeed Stoker Company, Ltd., concerning the rights that they have secured for manufacturing Vibro Conveyors under the Schenck-Heymann system at their Derby Works, this Company have already secured an order for six Schenck-Heymann Vibro Conveyors from Imperial Chemical Industries. The conveyors are of special design, and are capable of handling fine cement dust at a temperature of approximately 400° C. with capacities up to 30 tons per hour. We also understand that a further conveyor of this type has been ordered for use as a combined conveyor and screen, its capacity being 100 tons of limestone per hour. The Underfeed Stoker Company announce that a descriptive catalogue is in course of preparation, and will shortly be available.

Pan Ash Washer.

From Messrs. Head, Wrightson, & Co., Ltd., of Stockton-on-Tees, we have received a copy of their booklet on the patent "Nota Nos" washer. The washer is made in three standard sizes: "A"—With a No. 1 gear and gentle inclination of trough capable of washing fine slack not exceeding ½ in. at a rate of about 10 tons per hour per unit. "B"—With a No. 1 gear and medium inclination of trough capable of washing all sizes less than 1¼ in., including slack, at a rate of about 10 tons per hour per unit, providing that the proportion of slack does not exceed 25 p.ct.; but if all the material is about 1 in., the capacity may be increased to 15 tons per hour per unit. "C"—With a No. 2 gear, but with an 8-in. stroke and maximum inclination of trough capable of washing 1½ in. to 2½ in. material at a rate of about 15 tons per hour per unit.

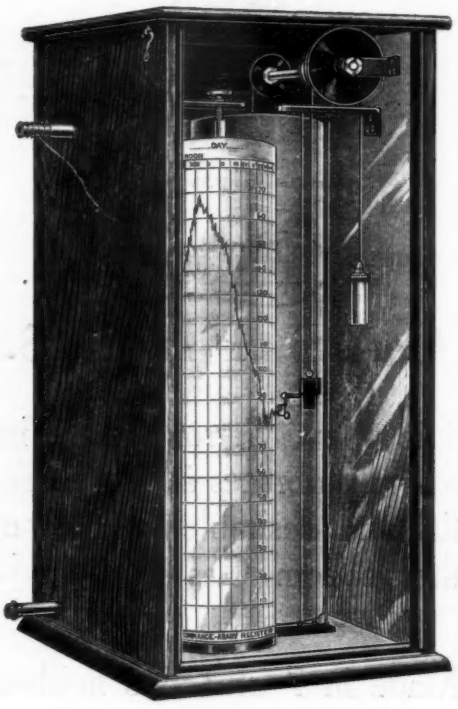
Coleford Gas and Coke Company, Ltd., has been registered as a private Company, with a nominal capital of £6000, to carry on the business of gas and coke manufacturers at Coleford, Glos. The Chairman of the Company is Mr. L. B. Trotter, M.D., of "Rossway," Ledbury, Herefordshire.

Price Reduction at Llandudno.—The Llandudno Council have reduced the price of gas by 4d. per 1000 c.ft. as from July 1 last. The price is now 4s. 9d. per 1000 c.ft., and, in addition, a rebate of 5 p.ct. is allowed. The Gas Committee have agreed to take over the tenancy of the Fish Market for the purpose of utilizing the premises as gas showrooms.

Montevideo Gas and Dry Dock Company, Ltd.—The Directors of the Company have declared an interim dividend on the ordinary stock of the Company for the half-year ended June 30, 1929, of 3 p.ct. (actual), free of income-tax, payable on Dec. 2, which compares with 2½ p.ct., free of tax, for the corresponding period of the previous year. Stockholders should not, however, take the increased dividend as indicating a larger distribution for the whole year.

Lisburn Street Lighting Incident.—Mr. A. S. Brook, Manager of Lisburn Gas-Works, was a witness in the Ulster High Court in a negligence action against the Urban Council by a carrier who alleged that a collision in which his vehicle was involved with a water trough was due not only to the trough as an obstruction but to its being unlighted and unprotected. Witnesses for the plaintiff sought to prove that in Lisburn the street lighting was defective, that several lamps which could be seen burning by day were extinguished at night. The inspector of the lights and clocks gave evidence as to his duties, which included an oversight of lamps at specified periods. The particular light in question was in perfect order, ant the clock was in good working condition. Judgment was reserved.

Gas Poisoning Inquest at Bristol.—The Bristol City Coroner, Mr. A. E. Barker, recently held an inquiry into the circumstances of the death of Mrs. Sarah Ann Harris (66), of 12, Clarence Road, who was found dead in her bedroom. The husband, William James Harris, stated that after an absence from the house of about an hour he returned, and going upstairs detected a smell of gas. He found his wife lying on the floor of a bedroom fully dressed, close to a gas ring. The ring was not alight, but he did not then notice if the gas was turned on or not. The ring was connected to the gas pipe by a flexible tube, but it had not been used for more than twelve months. The tubing was loose and came off easily. His wife was liable to heart attacks. So far as he knew there was nothing to worry or trouble her. Dr. Taylor, who was called in, said that in addition to the effects of gas poisoning, to which he thought death was due, he found heart trouble. P.C. Woodman said that deceased's husband told him that he had found the gas on and had turned it off. The least touch of the tap would turn the gas on. The door and windows were open and the chimney was not obstructed in any way. A verdict of "Accidental death" was returned.



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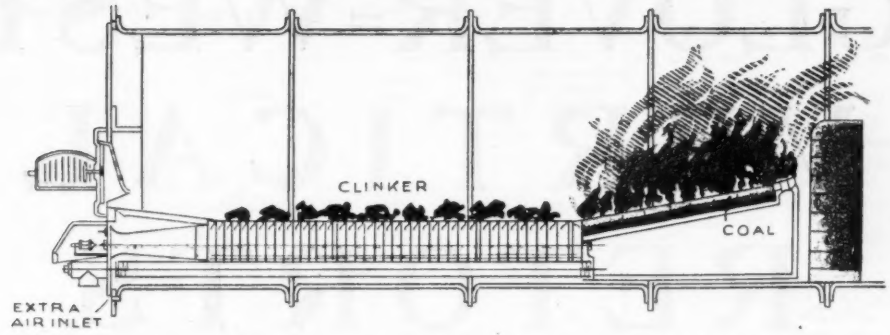

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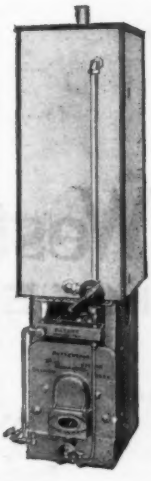

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[For Stock Market Report, see earlier pages.]

Issue.	Share.	When ex-Dividend.	Dividends, Prev. Hf.Yr	Dividends, Last Hf. Yr.	NAME.	Quotations. Nov. 8	Rise or Fall on Week.	Transactions Lowest and Highest Prices.
£			%p.a	% p.a.				
171,978	Stk.	Aug. 15	5	5	Aldershot 5 p.c. max. C.	70–75	..	..
413,992	,,	,,	4	4	Do. 4 p.c. Pref.	71–74	..	..
1,681,868	,,	Sept. 26	7½	7½	Alliance & Dublin Ord.	96–99	..	98—98½
274,000	,,	July 11	4	4	Do. 4 p.c. Deb.	62–65	..	..
525,555	,,	Aug. 29	7	7	Barnet Ord. 7 p.c.	112–115	..	..
900,000	1	Oct. 24	1/4½	1/4½	Bombay, Ltd.	16/–18/–	–/6	16/—16/6
120,500	10	Aug. 29	8½	9	Bournemouth 5 p.c.	12⅝–13½	..	..
600,000	10	,,	7	7	Do. B 7 p.c.	12⅝–12½	..	12½
439,150	10	,,	6	6	Do. Pref. 6 p.c.	10½–11	..	..
50,000	Stk.	July 11	3	3	Do. 3 p.c. Deb.	54–57	..	..
103,025	,,	,,	4	4	Do. 4 p.c. Deb.	72–75	..	72
867,300	,,	Aug. 29	7½	7½	Brighton & Hove 6 p.c. Con.	113–116	..	..
271,880	,,	,,	6⅔	6⅔	Do. 5 p.c. Con.	100–103	..	..
1,367,500	,,	July 25	5	5	Bristol 5 p.c. max.	88–89a	..	..
865,000	,,	Sept. 12	7½	7	British Ord.	115–118	..	115½—116
180,000	,,	June 27	7	7	Do. 7 p.c. Pref.	112–117	..	..
180,000	,,	,,	4	4	Do. 4 p.c. Red. Deb.	71–74	..	71
450,000	,,	,,	5	5	Do. 5 p.c. Red. Deb.	94–97	..	..
100,000	10	May 30	6	8	Cape Town, Ltd.	9–10	..	..
100,000	10	Nov. 7	4½	4½	Do. 4½ p.c. Pref.	6¾–7½*	..	..
150,000	Stk.	June 27	4½	4½	Do. 4½ p.c. Deb.	71–76	..	..
696,860	,,	July 25	6	6	Cardiff Con. Ord.	98–101	..	..
927,880	,,	June 27	7½	7½	Do. 7½ p.c. Red. Deb.	99–102	..	..
197,150	,,	Aug. 15	5½	5	Chester 5 p.c. Ord.	87–92b	..	..
98,936	1	Oct 10	1/-	1/-	Colombo Ltd. Ord.	34/–36/–	..	..
94,495	1	,,	1/4½	1/4½	Do. 7 p.c. Pref.	19/– 21/–	..	..
675,402	1	Oct. 10	1/9½	1/9½	Colonial Gas Assn. Ld. Ord.	23/6–25/6	..	..
197,848	1	,,	1/7½	1/7½	Do. 8 p.c. Pref.	20/– 22/–	..	..
1,073,380	Stk.	July 25	7	5	Commercial Ord.	92–95	..	93½—93½
175,000	,,	June 13	3	3	Do 3 p.c. Deb.	55–58	..	..
787,660	,,	Aug. 15	7	7	Croydon sliding scale	105–108	..	105½
488,100	,,	,,	5	5	Do. max. div.	77–82	..	..
543,270	,,	Aug. 29	10	7	Derby Con.	118–121e	..	..
55,000	,,	June 27	4	4	Do. Deb.	68–71e	..	..
900,000	,,	Aug. 29	5	5	East Hull Ord. 5 p.c.	73–75	..	..
1,000,180	10	Sept. 12	†7	†4	European, Ltd.	10½–12½	–½	10⅞—12
18,705,480	Stk	July 25	5⅝	5⅝	Gas Light & Coke 4 p.c. Ord.	18/4½–18/10½	–/4½	18/6—19/1½
3,600,000	,,	,,	3½	3½	Do. 3½ p.c. max.	60–62	..	61½—62
4,197,050	,,	,,	4	4	Do. 4 p.c. Con. Pref.	72–75	+1	71½—72
1,668,650	,,	June 13	3	3	Do. 3 p.c. Con. Deb.	55–58	..	58
1,643,770	,,	,,	5	5	Do. 5 p.c. Red. Deb.	97–100	..	99—100
69,500	,,	Aug. 29	7	7	Hastings & St L. 5 p.c. Conv	98–103	..	..
368,740	,,	,,	5½	5½	Do. 3½ p.c. Conv.	77–82	..	..
70,000	10	Oct. 10	†10	†10	Hongkong & China, Ltd	13½ 14½	..	..
312,200	Stk.	Aug. 29	6	6½	Hornsey Con. 3½ p.c.	84–87	..	..
1,918,000	,,	May 30	10	20	Imperial Continental Cap	335–365	–5	340—372
233,188	,,	Aug. 16	3½	3½	Do. 3½ p.c. Red. Deb.	71–16	..	72
365,243	,,	Aug. 15	7½	8	Lea Bridge 5 p.c. Ord.	115 118	..	..
3,145,967	,,	Aug. 15	6c	6	Liverpool 5 p.c. Ord.	93 93½b	–1½	..
600,000	,,	Sept. 26	7	7	Do. 7 p.c. Red. Pref.	100½–102½b	+1½	..
166,756	,,	Aug. 29	8	9	Maidstone 5 p.c. Cap.	122–127	..	124½
63,480	,,	June 27	3	3	Do. 3 p.c. Deb.	53–56	..	..
25,000	b	June 13	†8	†10	Malta & Mediterranean Metrop'l'n (of Melbourne)	5½–6	..	..
202,000	—	Oct. 1	5½	5½	5½ p.c. Red. Deb.	93–95	–4	92½
641,930	Stk.	May 30	†5	†9	Montevideo, Ltd.	105–108	..	107
1,051,818	,,	July 25	5⅝	5	Newcastle & Gateshead Con	16/9–17/3d	..	..
592,856	,,	,,	4	4	Do. 4 p.c. Pref.	71½–72½d	–½	..
991,705	,,	June 27	3½	3½	Do. 3½ p.c. Deb	66½–67½d	–1	..
181,780	,,	Aug. 29	7/1/0	7½	North Middlesex 6 p.c. Con.	112–117	..	114
900,000	,,	Apl. 24	9	7	Oriental, Ltd.	111–116	..	..
205,162	,,	June 27	8	8	Plym'th & Stonehouse 5 p.c.	110–113	..	..
424,416	,,	Aug. 29	8½	8	Portsm'th Con. Stk. 4p.c. Red.	113–118	..	..
241,445	,,	,,	5	5	Do. 5 p.c. max	80 83	..	..
2,334,454	1	June 27	—	†5	Primitiva Ord.	29/– 32/–	–1/–	32/3–32/6
244,500	100	June 3	4	4	Do. 4 p.c. Red. Deb.	92–95	..	..
695,000	Stk.	July 25	4	4	Do. 4 p.c. Red. Deb 1911	79–82	..	81
418,245	,,	June 27	4	4	Do. 4 p.c. Cons. Deb.	79–82	..	..
150,000	10	Sept. 26	6	6	San Paulo 5 p.c. Pref.	8½–9	..	..
1,736,968	Stk	Aug. 29	6⅔	6⅔	Sheffield Cons.	105–107e	..	..
95,000	,,	July 11	4	4	Do. 4 p.c. Deb.	75–77e	..	..
99,000	10	June 13	†4	†4	South African	4–6	..	..
2,009,896	Stk.	July 26	7½	5	South Met. Ord.	99 101	..	99½–100½
502,000	,,	,,	6	6	Do. 6 p.c. Irred. Pf.	106 109	..	107½
1,895,445	,,	July 11	3	3	Do. 3 p.c. Deb.	54 57	..	55
704,000	,,	Sept. 12	6½	6½	Do. 6½ p.c. Red. Db.	98–100	..	99½—99
21,500	,,	Aug. 15	8½	8½	South Shields Con.	109 111d	..	..
1,943,726	,,	July 25	6½	6½	South Suburban Ord. 6 p.c.	101 104	..	100½—102
488,527	,,	June 27	5	5	Do. 5 p.c. Deb.	94–97	..	..
947,740	,,	Aug. 15	5	5	South'mpton Ord. 5 p.c. max.	77 80	..	..
181,275	,,	June 27	4	4	Do. 4 p.c. Deb.	70 73	..	..
173,014	,,	July 25	8	8	Sutton Ord.	116–119	..	..
67,828	,,	June 27	5	5	Do. 5 p.c. Deb.	90–93	..	..
840,000	,,	Feb. 21	7	7	Swansea 7 p.c. Red. Pref.	100–102	..	..
800,000	,,	June 27	6½	6½	Do. 6½ p.c. Red. Deb.	100–102	..	..
1,302,375	,,	Aug. 15	6⅔	6⅔	Tottenham District Ord.	104–107	..	104—105
150,000	,,	,,	5½	5½	Do. 5½ p.c. Pref.	97–100	..	..
181,355	,,	June 13	4	4	Do. 4 p.c. Deb.	74–77	..	..
389,894	,,	Aug. 29	7	7	Uxbridge, Maidenhead, & Wycombe 5 p.c.	97–102	+4	..
80,000	,,	,,	5	5	Do. 5 p.c. pref.	85–90	..	..
80,000	,,	July 11	9	9	Wandsworth, Wimbledon and Epsom— Wandsworth A 5 p.c.	135–140	..	..
956,686	,,	,,	7½	7½	Do. B 5½ p.c	112–117	..	..
432,535	,,	,,	6⅚	6⅚	Do. C and New	95–100	..	..
862,000	,,	,,	7⅝	7⅝	Do. Wimbledon 5 p.c	105–110	..	106
96,000	,,	,,	7⅝	7⅝	Do. Epsom 5 p.c.	113–118	..	..
200,000	,,	,,	5	5	Do. 5 p.c. Pref	87–92	..	..
96,416	,,	June 27	3	3	Do. 3 p.c. Deb.	54–57	..	..
994,749	,,	,,	4	4	Do. 4 p.c. Deb.	74–77	..	..
397,660	,,	,,	5	5	Do. 5 p.c. Deb.	93–96	..	..

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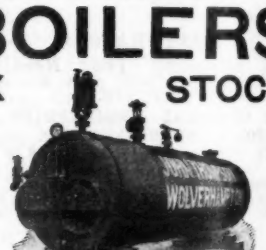

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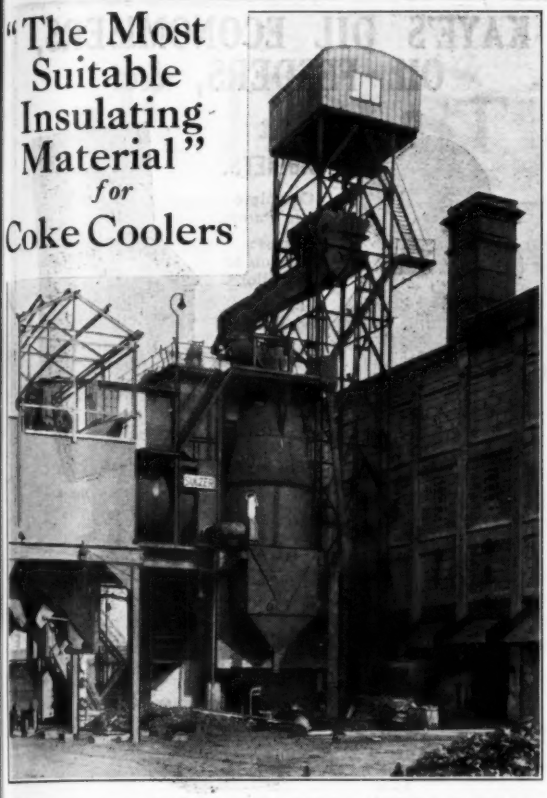

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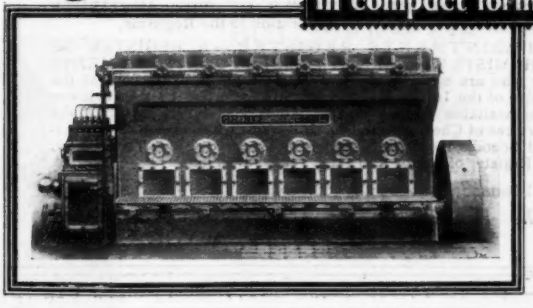

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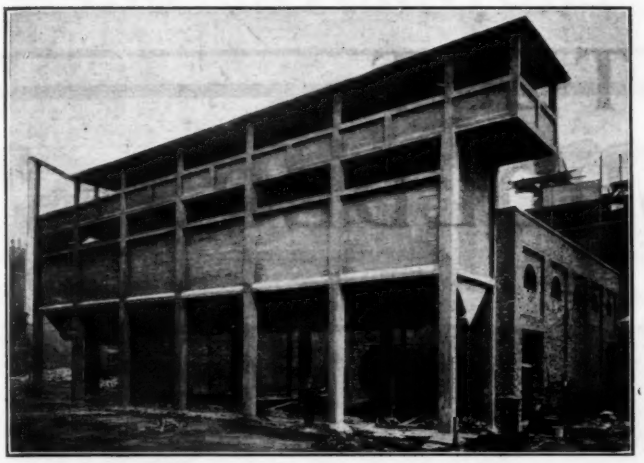

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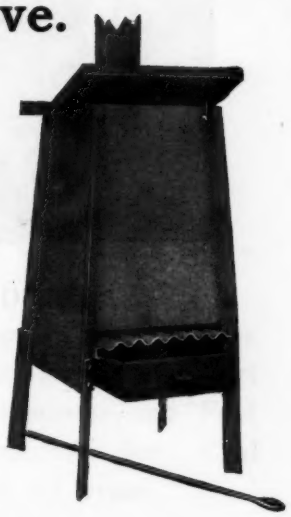

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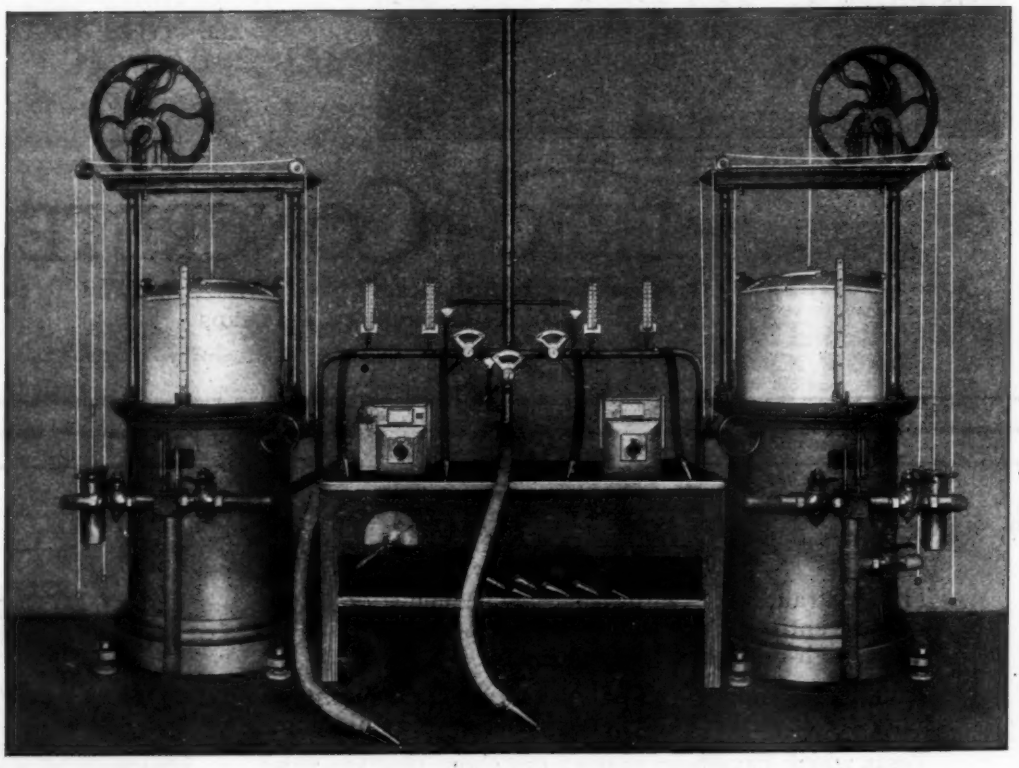

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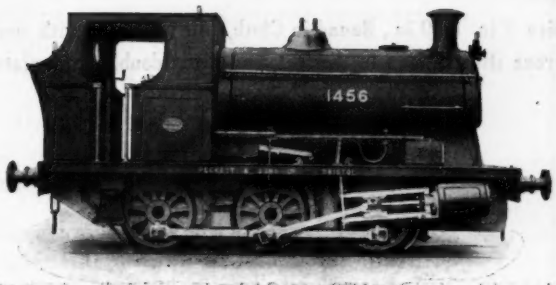

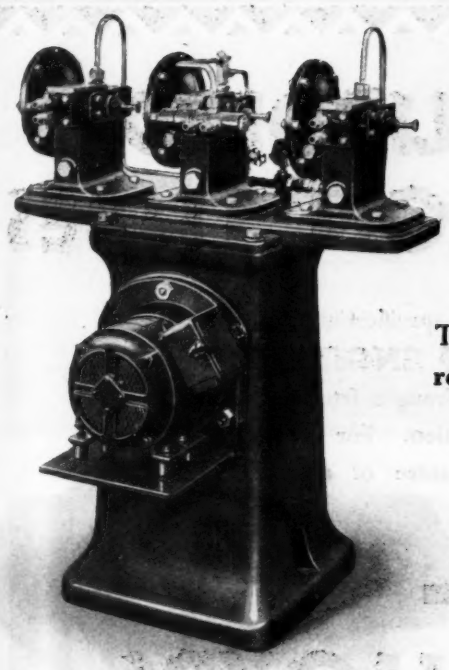

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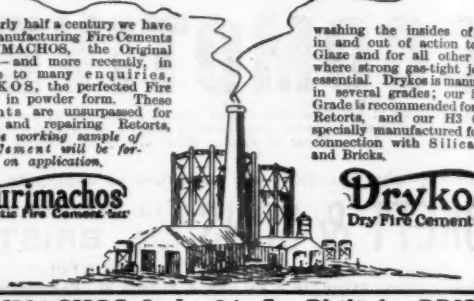

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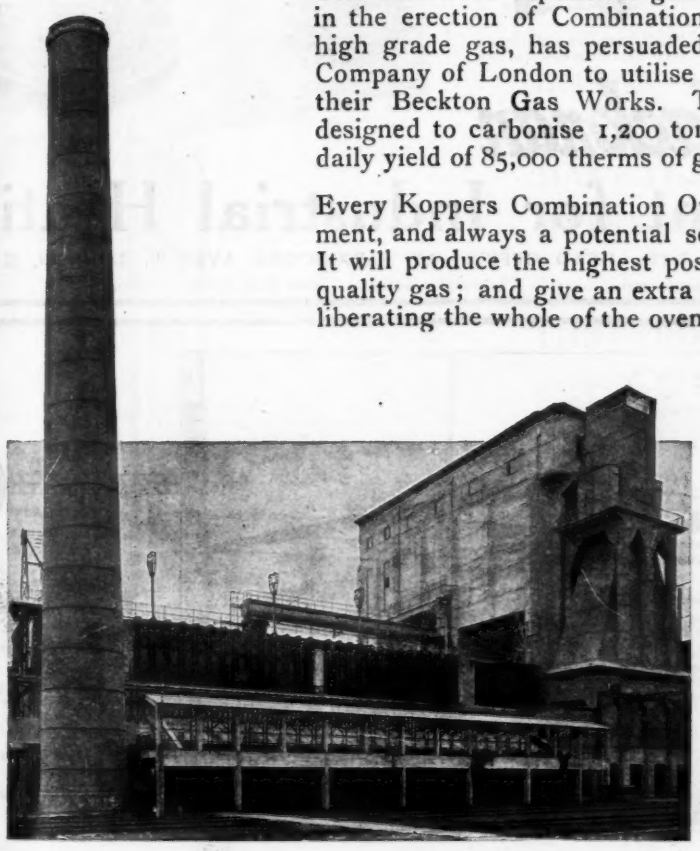

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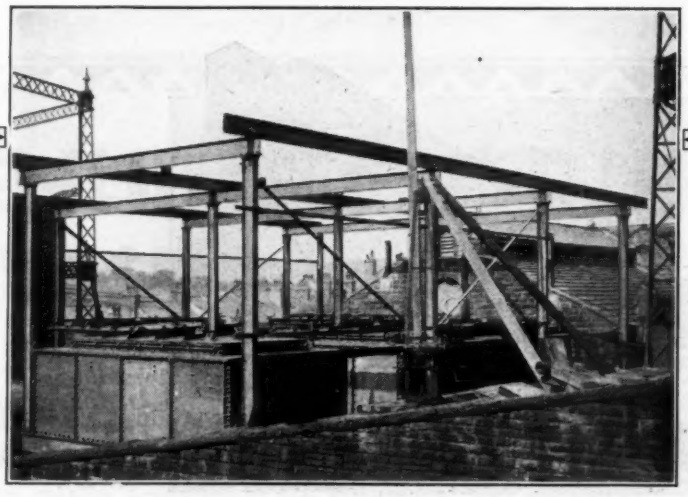

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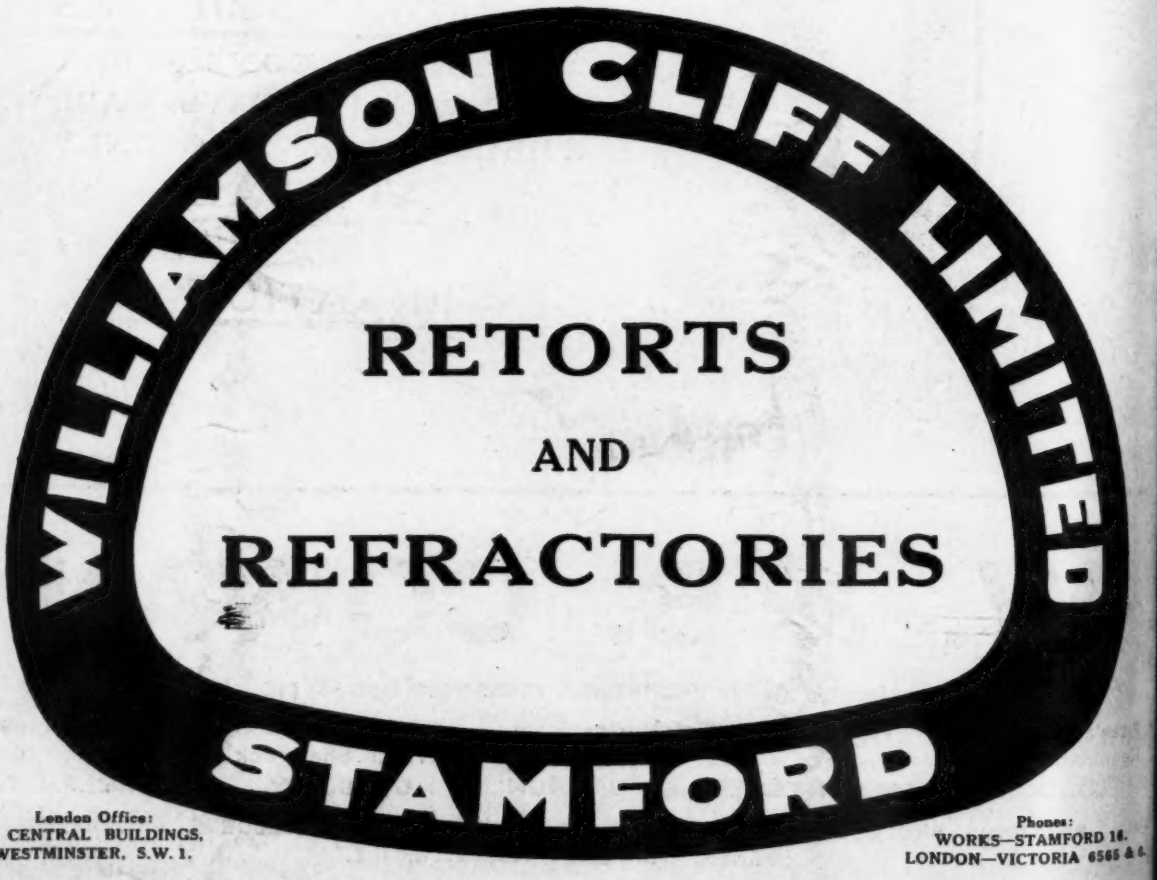

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